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No. CP-UM-1679E

SDC40B
DIGITRONIK
Digital Indicating Controller

User's Manual

Basic Operations

Thank you for purchasing the SDC40B. This manual contains information for ensuring correct use of the SDC40B. It also provides necessary information for installation, maintenance, and troubleshooting.
This manual should be read by those who design and maintain devices that use the SDC40B.
Be sure to keep this manual nearby for handy reference.

Yamatake Corporation

RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment.
Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

IMPORTANT

COMBINING SDC40B'S COMPUTATIONAL FUNCTIONS CAN BE PERFORMED ONLY WITH A PERSONAL COMPUTER EMPLOYING THE OPTIONAL MASTER LOADER PACKAGE. COMBINING COMPUTATIONAL FUNCTIONS CANNOT BE PERFORMED BY THE SDC40B UNIT ALONE.

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact Yamatake Corporation.

In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

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SAFETY REQUIREMENTS

To reduce risk of electric shock which could cause personal injury, follow all safety notices in this documentation.

This symbol warns the user of a potential shock hazard where hazardous live voltages may be accessible.

- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment must be impaired.
- Do not replace any component (or part) not explicity specified as replaceable by your supplier.
- All wiring must be in accordance with local norms and carried out by authorized and experienced personnel.
- The ground terminal must be connected before any other wiring (and disconnected last).
- A switch in the main supply is required near the equipment.
- Mains power supply wiring requires a (T) 1A, 250V fuse(s).

EQUIPMENT RATINGS

Supply voltages	: 100 to 240Vac (operation power voltage:90 to 264Vac)
Frequency	: 50/60Hz
Power consumption	: 25VA maximum

EQUIPMENT CONDITIONS

Do not operate the instrument in the presence of flammable liquids or vapors. Operation of any electrical instrument in such an environment constitutes a safety hazard.

Temperature	: 0 to 50˚C
Humidity	: 30 to 90%RH
Over-voltage category	: Category II(IEC60364-4-443, IEC60664-1)
Pollution degree	: 2

EQUIPMENT INSTALLATION

- The controller must be mounted into a panel to limit operator access to the rear terminals.
- Specification of common mode voltage: The common mode voltages of all I/O except for main supply and relay outputs are less than 33Vrms, 46.7V peak and 70Vdc.

APPLICABLE STANDARD

EN61010-1, EN61326

SAFETY PRECAUTIONS

■ About Icons

The safety precautions described in this manual are indicated by various icons. Please be sure you read and understand the icons and their meanings described below before reading the rest of the manual.

Safety precautions are intended to ensure the safe and correct use of this product, to prevent injury to the operator and others, and to prevent damage to property. Be sure to observe these safety precautions.

⚠ **WARNING**	Warnings are indicated when mishandling this product might result in death or serious injury.
⚠ **CAUTION**	Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to the product.

■ Examples

	Use caution when handling the product.
	The indicated action is prohibited.
	Be sure to follow the indicated instructions.

⚠WARNING

	Before wiring, or removing/mounting the SDC40B, be sure to turn the power OFF. Failure to do so might cause electric shock.
	Ground the FG terminal with a ground resistance of maximum 100 Ω before connecting to the measurement target and external control circuits. Failure to do so might cause electric shock or fire.
	Do not disassemble the SDC40B. Doing so might cause electric shock or faulty operation.
	Do not touch electrically charged parts such as the power terminals. Doing so might cause electric shock.

⚠CAUTION

	Wire the SDC40B properly according to predetermined standards. Also wire the SDC40B using specified power leads according to recognized installation methods. Failure to do so might cause electric shock, fire or faulty operation.
	Do not touch internal components during use or immediately after turning the power OFF. Doing so might cause burns.
	Do not use pointed objects such as mechanical pencils or pins to press the keys on the SDC40B. Doing so might cause faulty operation.
	Use the SDC40B within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.). Failure to do so might cause fire or faulty operation.
	Do not block ventilation holes. Doing so might cause fire or faulty operation.
	Do not allow lead clippings, chips or water to enter the controller case. Failure to do so might cause fire or faulty operation.
	Inputs to the current input terminals (㉛•㉝and ㉘•㉙) on the SDC40B should be within the current and voltage ranges listed in the specifications. Otherwise electric shock or faulty operation could occur.
	Firmly tighten the terminal screws at the torque listed in the specifications. Insufficient tightening of terminal screws might cause electric shock or fire.

⚠CAUTION

	Do not use unused terminals on the SDC40B as relay terminals. Doing so might cause electric shock, fire or faulty operation.
	We recommend attaching the terminal cover (sold separately) after wiring the SDC40B. Failure to do so might cause electric shock.
	Use the relays on the SDC40B within the service life listed in the specifications. Continued use of the relays after the recommended service life might cause fire or faulty operation.
	Use Yamatake's SurgeNon if there is the risk of power surges caused by lightning. Failure to do might cause fire or faulty operation.

Foreword

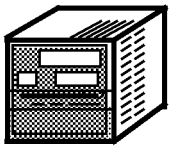
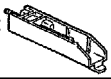
Thank you for purchasing the SDC40B Digital Indicating Controller.
This manual describes how to install and connect lines to the SDC40B, and provides troubleshooting procedures, specifications and other information required to gain an overall understanding of SDC40B operations.
This manual contains the instructions required to properly operate the SDC40B: we strongly urge its reading by all persons responsible for console operation and equipment design utilizing the SDC40B, as well as those involved in its maintenance.

Unpacking

When unpacking the product, check the following:

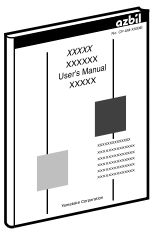
1. Model numbers to ensure that you have received the product you ordered;
2. Unit appearance for damage;
3. That all accessories are included.

If any of the accessories listed in the table below are missing, or the product has been damaged in shipping, immediately contact your dealer.
After unpacking, store any unused accessories in a safe place to prevent loss or damage.

Model	Model number	Qt'y	Remarks
SDC40B 		1	Refer to Section 1-3, "Model Number Table" on page 1-3.
Mounting bracket 	81405411-001	2	
Unit indicating label	N-3132	1	

The Role of This Manual

A total of four different manuals are available for the SDC40B. Read them as necessary for your specific requirements. If a manual you require is not available, contact Yamatake Corporation or its dealer.

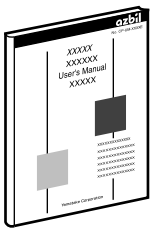


SDC40B DIGITRONIK Digital Indicating Controller: "Basic Operations"
Manual No. CP-UM-1679E

This Manual.

This is the manual you are now reading. It is provided with the SDC40B unit. We strongly urge persons responsible for device design, operations, and maintenance on the SDC40B read this manual.

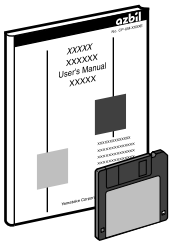
It describes how to mount the unit to a operation console or other location, wire and configure the unit; it also contains maintenance and inspection information, troubleshooting tips and specifications.



SDC40B DIGITRONIK Digital Indicating Controller:
"Computational Functions" Manual No. CP-UM-1680E

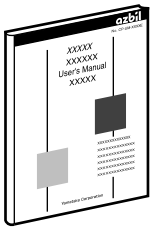
We strongly urge persons responsible for device design and control programming development on the SDC40B read this manual.

Control computation functions can be loaded onto the SDC40B according to the application being used. This manual explains computational expressions in detail. It also serves as an instrumentation design guide in that it contains control computation examples.



SLP-C4B Smart Loader Package for SDC40B Digital Indicating Controller
Manual No. CP-UM-1681E

This manual is provided on a floppy disk that comes with Smart Loader Package. Use a PC for programming to incorporate the computational expressions reqired by the operation processing block of SDC40B. Operations on a PC are also described in this manual.



SDC40B DIGITRONIK Digital Indicating Controller:
"CPL Communication Functions" Manual No. CP-UM-1683E

We strongly urge persons using the SDC40B CPL Communications functions read this manual.

This manual overviews CPL communications, and explains wiring and communications procedures. It also provides a list of communications data for the SDC40B, troubleshooting measures, and communications specifications.

Organization of This User's Manual

This user's manual consists of the following nine chapters which are outlined below:

Chapter1. GENERAL

This chapter explains the use and features of the SDC40B and overviews its system configuration. It also provides a list of serial numbers of included and related components.

Chapter2. NAMES AND FUNCTIONS OF COMPONENTS

This chapter lists and explains the names and functions of the various SDC40B components. It also contains usable input types and range numbers.

Chapter3. INSTALLATION

This chapter explains how to mount the SDC40B to an operation console.
We strongly urge persons involved in designing hardware using the SDC40B read this chapter.

Chapter4. WIRING

This chapter lists points to note when connecting the SDC40B to other equipment and explains wiring procedures.
We strongly urge persons involved in designing hardware and persons responsible for wiring read this chapter.

Chapter5. FUNCTIONS AND SYSTEM CONFIGURATION

This chapter explains the SDC40B functions in detail.
We strongly urge persons involved in designing control systems utilizing the SDC40B read this chapter.

Chapter6. COMPUTATIONAL EXPRESSIONS

This chapter explains the computational functions provided in the SDC40B.
We strongly urge persons involved in designing control systems utilizing the SDC40B read this chapter.

Chapter7. OPERATING THE SDC40B

This chapter explains the loading of a program developed on the SDC40B smart loader package onto the SDC40B and how to operate the unit thereafter.

Chapter8. TROUBLESHOOTING AND CORRECTIVE MEASURES

This chapter provides check points and corrective measures to take when the SDC40B is not operating properly.

Chapter9. SPECIFICATIONS

This chapter provides general specifications, performance specifications, external dimensions and other technical information on the SDC40B.

Conventions Used in This Manual

This manual uses the following conventions to alert readers to important information:

⚠WARNING	Text preceded with "WARNING" alerts the reader to a hazard. Always heed such an alert!
Handling Precautions	Text preceded with "Handling Precautions" alerts the reader to points of note when operating the unit.
NOTE	Text preceded with "NOTE" alerts the reader to supplementary explanations or reference materials.

Contents

SAFETY REQUIREMENTS
SAFETY PRECAUTIONS
Foreword
Unpacking
The Role of This Manual
Organization of This User's Manual
Conventions Used in This Manual

Chapter 1. GENERAL

1-1 Features 1-1
1-2 CPL Communications Network based Configuration 1-2
1-3 Model Number 1-3
1-4 Input Types and Range Numbers 1-4
■ Input 1 1-4
■ Input 2 DC current/voltage 1-5
■ Input 3 DC voltage 1-5

Chapter 2. NAMES AND FUNCTIONS OF COMPONENTS

2-1 Names of External Components 2-1
2-2 Names and Functions of the Console Unit Display Indicators 2-2
2-3 Names and Functions of Console Unit Keys 2-3

Chapter 3. INSTALLATION

3-1 External Dimensions 3-1
3-2 Panel Cutout Dimensions 3-2
3-3 Mounting 3-3
■ Location 3-3
■ Procedure 3-4
■ Dustproof cover 3-5

Chapter 4. WIRING

4-1 Precautions on Wiring 4-1
4-2 Recommended Cables 4-3
4-3 Making Terminal Connections 4-4
4-4 Terminal Layout and Recommended Wire Lead-out Directions 4-5
4-5 Wiring Diagrams of Standard and Extended Terminal Bases 4-6
■ Layout of standard terminal 4-6
■ Layout of extended terminal 4-7
4-6 Connecting the Power Supply and Grounding 4-8
■ Power supply 4-8
■ Grounding 4-8
4-7 Connecting the Analog Inputs 4-9
■ Connecting input 1 4-9
■ Connecting input 2 4-9
■ Connecting input 3 4-9
4-8 Connecting the Control Output (Analog Output 1) 4-10
■ Using current output (5G) 4-10
■ Using position proportional output (2G) 4-10

4-9 Connecting the Auxiliary Outputs (Analog Output 2,3) 4-11
■ Auxiliary output of control output 5G 4-11
■ Auxiliary output of control output 2G 4-11
4-10 Connecting the Relay Digital Outputs 4-12
4-11 Connecting the Open Collector Digital Outputs 4-13
4-12 Connecting the Digital Outputs 4-14
4-13 Connecting the Communications Interface 4-15
■ Connecting to an RS-232C communications interface 4-15
■ Connecting to an RS-485 communications interface 4-15
4-14 Corrective measures 4-18
■ Sources of electrical interference 4-18
■ Electrical interference suppression measures 4-18
4-15 Isolating Inputs and Outputs 4-19
■ Control output 5G 4-19
■ Control output 2G 4-19

Chapter 5. FUNCTIONS AND SYSTEM CONFIGURATION

5-1 Outline of Functions 5-1
5-2 Types of System Data 5-3
5-3 Principles of Operation 5-5
5-4 Input Processing Functions 5-6
■ Approximation by linearization table (TBL) 5-7
■ Temperature compensation (T.COMP) 5-7
■ Pressure compensation(P.COMP) 5-8
■ Square root extraction(SQRT) 5-8
■ Digital filtering(DIG.FILT) 5-9
5-5 Computational Processing Functions 5-10
■ Determining computational functions (computational unit data settings) . 5-10
■ Control computation settings 5-12
■ Manual output computation settings 5-15
■ Determining the computation processing cycle 5-17
5-6 Output Processing Functions 5-18
5-7 Modes 5-19
■ Mode transitions 5-19
■ Normal operating modes 5-20
■ Emergency operating modes 5-20
■ Loader configuration mode 5-21
5-8 Control Types 5-22
■ Control type 0 5-22
■ Control type 1 5-22
■ Control type 2 5-23
■ Control type 3 5-24
5-9 Auto Balance Functions 5-25
■ Auto balancing control type 0 5-25
■ Auto balancing control type 1 5-26
■ Auto balancing control type 2 5-28
■ Auto balancing control type 3 5-29
5-10 Self-Diagnostic Functions 5-30
■ Power ON self-diagnostic routines 5-30
■ Self-diagnostic routines performed each computation cycle 5-30

Chapter 6. COMPUTATIONAL EXPRESSIONS

6-1 Computational units 6-1
6-2 List of Computational Expressions 6-2
- List of Computational Expressions 6-2
- List of internal signals 6-5

Chapter 7. OPERATING THE SDC40B

7-1 Power ON 7-1
- Cold start 7-1
- Hot start 7-1

7-2 Changing Normal Display (Display) Items 7-2
- Standard normal display mode items 7-2
- Additional display unit (1 to 4) items 7-2

7-3 Bar Graph Display 7-7
- As an analog monitor 7-7
- As a digital monitor 7-7

7-4 System Operating Procedures 7-8
7-5 LSP Settings 7-9
7-6 Manual Output Settings 7-11
7-7 Control Data Settings 7-12
- Selecting control data settings groups 7-12
- Progression of individual items in control data settings 7-13
- Modifying individual items and exiting the setting mode 7-13

7-8 Using the UF Keys 7-15
- Using the UF Keys 7-15
- Assigning setting items 7-15
- Using UF Keys as user input switches 7-17

7-9 List of Control Data and Monitor Data Settings 7-18
- Setup data settings [SEtUP] 7-18
- Detailed descriptions of setup data 7-22
- Input processing data settings [In] 7-27
- Control computational data settings [contL] 7-34
- Detailed descriptions of control computational data 7-37
- PID parameter settings [PId] 7-38
- Linearization table data settings [tbL] 7-42
- PTB table data settings [Ptb] 7-47
- TTB table data settings [ttb] 7-52
- Variable parameter (percentage format) settings [P.PArA] 7-57
- Variable parameter (time format) settings [t.PArA] 7-58
- Variable parameter (flag format) settings [F.PArA] 7-59
- Variable parameter (index format) settings [I.PArA] 7-60
- Engineering unit parameter settings [E.PArA] 7-61
- UF key processing data settings [UF] 7-62
- Digital input processing data settings [dI.Fnc] 7-63
- ID data settings [Id] 7-64
- Protect settings [Prtct] 7-65
- Computational unit monitor [Unit] 7-66
- Input/output signal monitor [Io.dAt] 7-67

7-10 Password Functions 7-69
■ Setting method of passwords 7-69
■ Canceling method of passwords 7-70
■ Password setting [PASS] 7-70
■ Operating method of the general reset 7-71

Chapter 8. TROUBLESHOOTING AND CORRECTIVE MEASURES

8-1 Alarm Code Display 8-1
8-2 Key Input Related Trouble 8-2
■ Pressing PARA key enables protect setting only 8-2
■ AUTO key is ineffective in normal display mode 8-2
■ CAS key is ineffective in normal display mode 8-2
■ MAN key is ineffective in normal display mode 8-2
■ AT key is ineffective in normal display mode 8-3
8-3 Motor Adjustment Not Possible 8-4
■ Standard normal direction wiring 8-4
■ Standard reverse direction wiring 8-4
■ Alarm codes and their causes when wiring errors are detected 8-5
8-4 SDC40B Loader Communications Not Passible 8-6

Chapter 9. SPECIFICATIONS

9-1 Specifications 9-1
■ List of Accessories 9-7
■ Input types and ranges (selected at setup) 9-8
■ Data and setting procedures 9-10
■ List of computational expressions 9-10
9-2 External Dimensions 9-13
■ Main body 9-13
■ Soft dust-proof cover set 9-14
■ Hard dust-proof cover set 9-14
■ Terminal cover set 9-14

Chapter 10. MAINTENANCE

Index

Chapter. 1 GENERAL

1 - 1 Features

The DIGITRONIK SDC40B is a general-purpose, single-loop controller designed to control temperatures, pressures, flow rates, levels, pH values and other varying physical conditions. Combining PID control and numerous auxiliary functions in a single unit, the SDC40B provides high cost-performance control for your device and instrumentation needs. In addition, a PC loader enables you to design any combination of functions.

- **Unique analog input / output**

  The SDC40B provides three analog inputs. One of these is full multi-input, enabling direct input of a thermocouple, RTD (resistance temperature detector), or other voltage / current device.
  As for analog outputs, the 5G model provides three (4 to 20mA ×3) and the 2G model provides two (a 2G output and a 4 to 20mA output), permitting a motor to be driven directly without use of a converter.

- **A rich endowment of digital I / O**

  In addition to mode changeover, selection setting, event output, etc., the 12 digital inputs and 8 digital outputs (3 relay outputs and five open collector outputs) provided on the SDC40B permit direct connection to internal computations, providing the user the ability to flexibly accommodate automated systems that use controllers such as PLCs.

- **Advanced control functions**

  The SDC40B provides the ability to select one of four provided control modes, including cascade control, enabling the user to perform advanced control with smart-tuning effective for two degrees of freedom PID control, neural network tuning, and overshoot suppression.

- **A host of Computational functions**

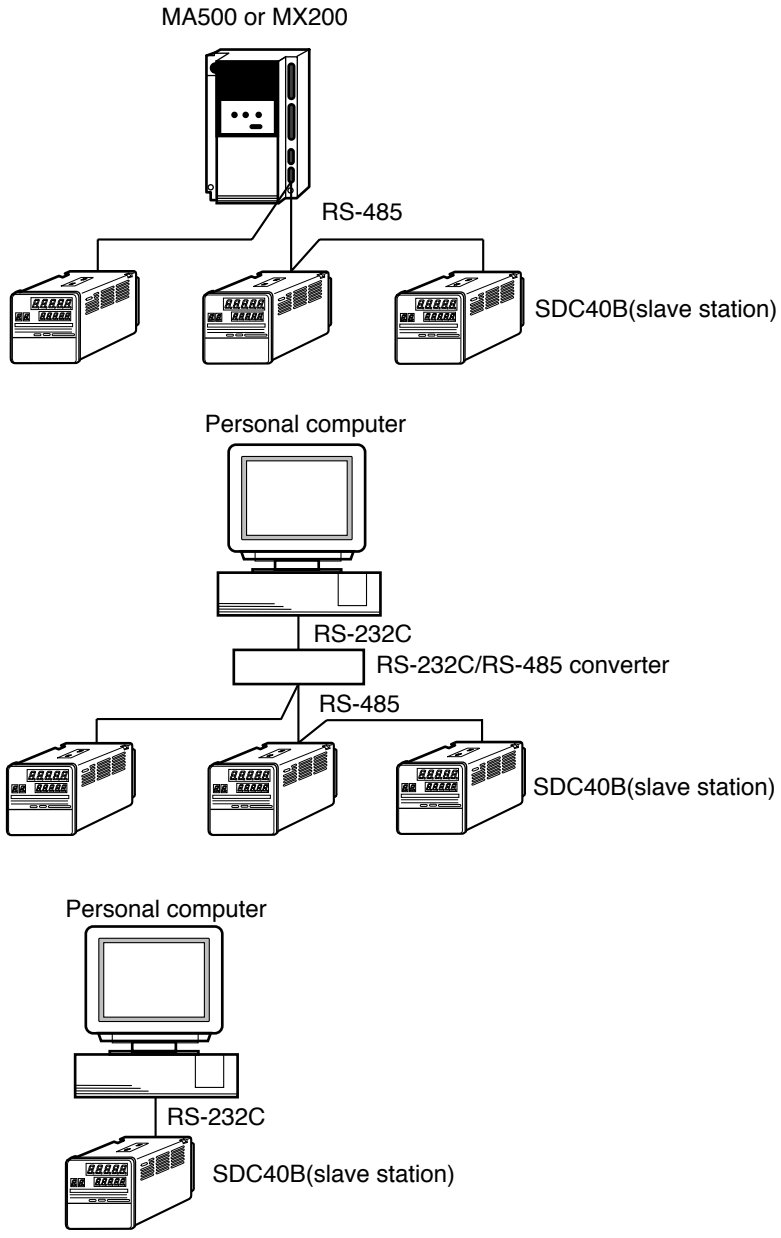
  Roughly 80 computational expressions, including the four arithmetic computation, selectors and linearization tables, can be assigned to as many as 50 computational units and employed in a wide variety of combinations.

- **Simple engineering**

  The PC loader simplifies procedures for combining computational units and selecting other configuration settings.

1 - 2 CPL Communications Network based Configuration

Models equipped with the optional RS-485 communications interface can be connected as a slaved DIGITRONIK's controller to a CPL communications(Controller Peripheral Link:Yamatake host communication protocol) network. In this case, the user can employ as the master station the Yamatake's MA500 FA (Factory Automation) Controller or the MX200 Super Controller.
Models equipped with the optional RS-232C communications interface can be configured in a point-to-point CPL communications network with a personal computer serving as the master station and the SDC40B as the slave station.



1 - 3 Model Number

Basic model No.	Control output	Func-tion	Power supply	Options 1	Options 2	Additional processing	Specifications
C40B							Digital indicating controller
	2G						Position proportional output
	5G						Current output
		4					Input1: Thermocouples, RTDs, DC current, DC voltage of multi-range Input2: 4 to 20mA DC, 1 to 5V DC Input3: 1 to 5V DC
			AS				AC power supply(90 to 264V AC :Free power supply)
			DS				DC power supply(21.6 to 26.4V DC)
				06*			1 auxiliary output, 12 digital inputs, 8 digital outputs (3 relays, 5 open collectors)
				09*			2 auxiliary outputs, 12 digital inputs, 8 digital outputs (3 relays, 5 open collectors)
					1		No communications interface
					2		RS-485 communication
					3		RS-232C communication
						00	Additional processing not provided
						T0	Tropical treatment
						K0	Antisulfide treatment
						D0	Inspection Certificate provided
						B0	Tropical treatment+Inspection Certificate provided
						L0	Antisulfide treatment+Inspection Certificate provided
						Y0	Complying with the traceability certification

*An option 06 can specify only at the time of control output 2G.
An option 09 can specify only at the time of control output 5G.

1 - 4 Input Types and Range Numbers

■ Input 1

● Thermocouple

Input type	Range number	Code	°C range	°F range
K (CA)	0	K09	0.0 to 1200.0	0 to 2400
K (CA)	1	K08	0.0 to 800.0	0 to 1600
K (CA)	2	K04	0.0 to 400.0	0 to 750
K (CA)	3	K29	-200.0 to +1200.0	-300 to +2400
K (CA)	4	K44	-200.0 to +300.0	-300 to +700
K (CA)	5	K46	-200.0 to +200.0	-300 to +400
E (RC)	6	E08	0.0 to 800.0	0 to 1800
J (IC)	7	J08	0.0 to 800.0	0 to 1600
T (CC)	8	T44	-200.0 to +300.0	-300 to +700
B (PR30-6)	9	B18	0.0 to 1800.0	0 to 3300
R (PR13)	10	R16	0.0 to 1600.0	0 to 3100
S (PR10)	11	S16	0.0 to 1600.0	0 to 3100
W (WRe5-26)	12	W23	0.0 to 2300.0	0 to 4200
W (WRe5-26)	13	W14	0.0 to 1400.0	0 to 2552
PR40-20	14	D19	0.0 to 1900.0	0 to 3400
Ni-Ni•Mo	15	Z13	0.0 to 1300.0	32 to 2372
N	16	U13	0.0 to 1300.0	32 to 2372
PL II	17	Y13	0.0 to 1300.0	32 to 2372
DIN U	18	Z08	-200.0 to +400.0	-300 to +750
DIN L	19	Z07	-200.0 to +800.0	-300 to +1600

● Resistance temperature detector (RTD)

Input type	Range number	Code	°C range	°F range
JIS'89 Pt100 (IEC Pt 100Ω)	32	F50	-200.0 to +500.0	-300.0 to +900.0
	33	F46	-200.0 to +200.0	-300.0 to +400.0
	34	F32	-100.0 to +150.0	-150.0 to +300.0
	35	F36	-50.0 to +200.0	-50.0 to +400.0
	36	F38	-60.00 to +300.0	-76.00 to +104.00
	37	F33	-40.00 to +40.00	-40.00 to +140.00
	38	F05	0.0 to 500.0	0.0 to 900.0
	39	F03	0.0 to 300.0	0.0 to 500.0
	40	F01	0.00 to 100.00	0.00 to 200.00
JIS'89 J Pt100	48	P50	-200.0 to +500.0	-300.0 to +900.0
	49	P46	-200.0 to +200.0	-300.0 to +400.0
	50	P32	-100.0 to +150.0	-150.0 to +300.0
	51	P36	-50.0 to +200.0	-50.0 to +400.0
	52	P38	-60.00 to +40.00	-76.0 to +104.00
	53	P33	-40.00 to +60.00	-40.00 to +140.00
	54	P05	0.0 to 500.0	0.0 to 900.0
	55	P03	0.0 to 300.0	0.0 to 500.0
	56	P01	0.00 to 100.00	0.00 to 200.00

● **DC current/voltage**

Input type	Range number	Code	Range (program mable)
4 to 20mA	64	C01	-19999 to +26000
0 to 20mA	65	C08	
0 to 10mV	66	M01	
10 to +10mV	67	L02	
0 to 100mV	68	L01	
0 to 1V	69	L04	
-1 to +1V	70	L08	
1 to 5V	71	V01	
0 to 5V	72	L05	
0 to 10V	73	L07	

■ Input 2 DC current/voltage

Input type	Range number	Code	Range (program mable)
4 to 20mA	0	C01	-19999 to +26000
1 to 5V	1	V01	

■ Input 3 DC voltage

Input type	Code	Range (program mable)
1 to 5V	V01	-19999 to +26000

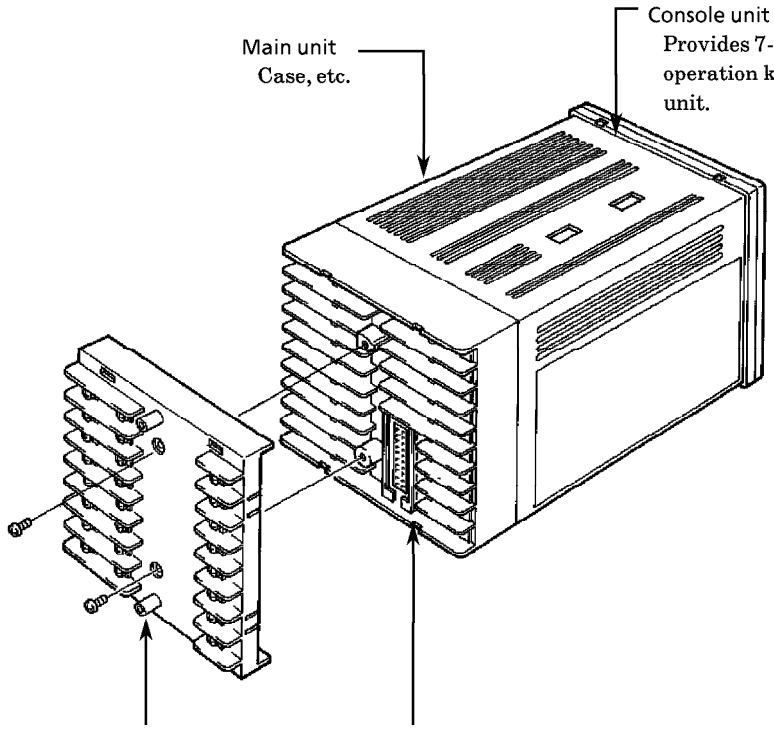
⚠ Handling Precautions

- To set an input range type (SELUP C 10, C 14), enter the range number from the 4 tables above. Do not enter a number other than the range numbers listed in the tables.

Chapter2. NAMES AND FUNCTIONS OF COMPONENTS

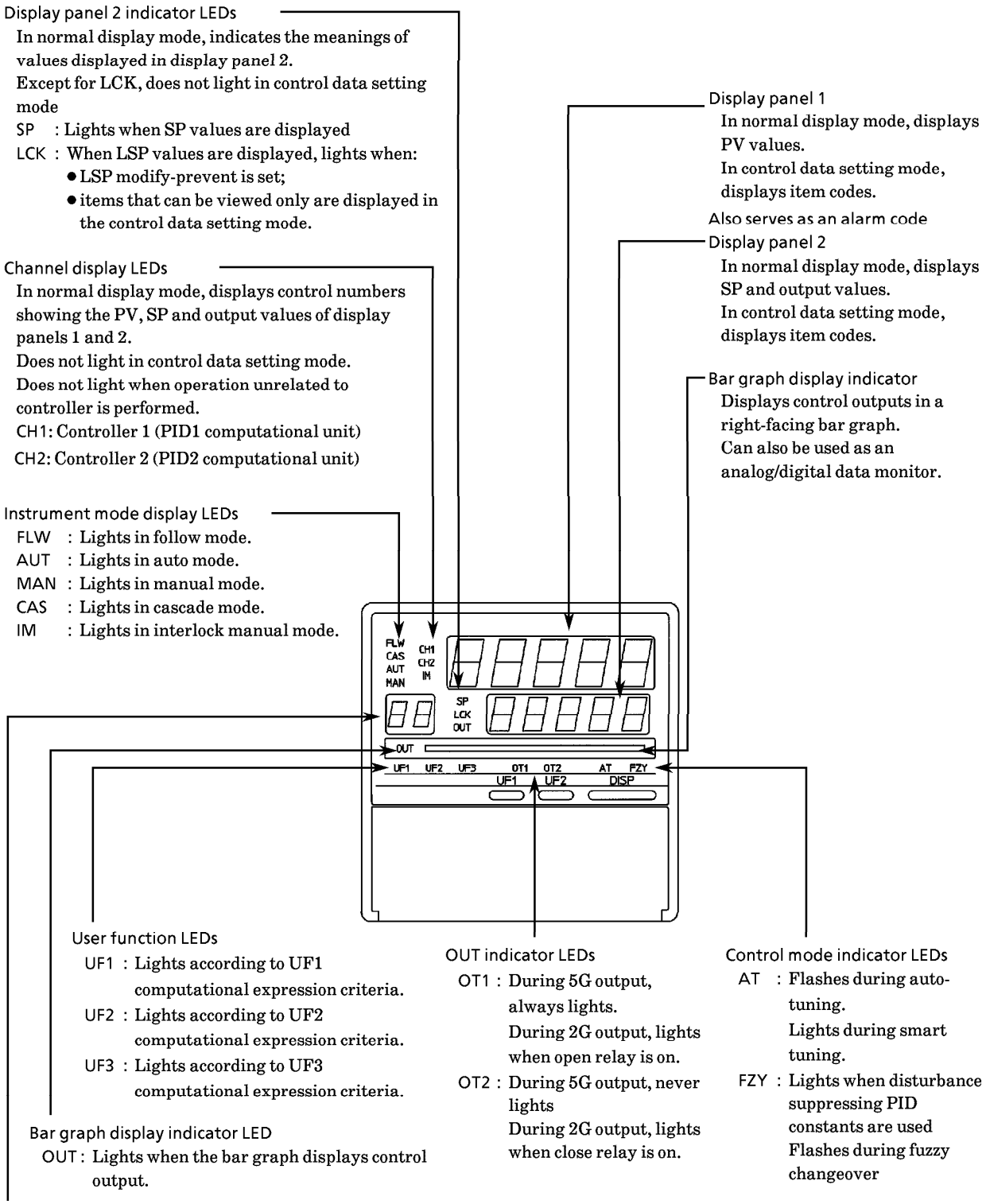
2 - 1 Names of External Components

The SDC40B consists of a console unit, main unit, standard terminal base, and extended terminal base.

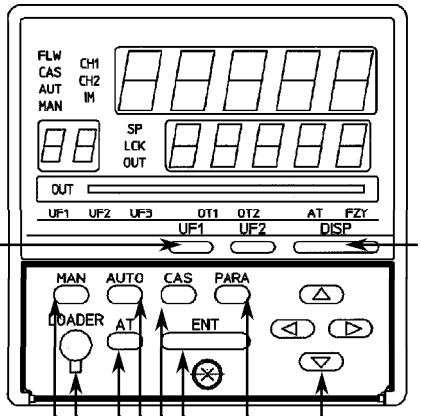

Main unit
Case, etc.
Console unit
Provides 7-segment displays, LEDs, operation keys, and a loader interface unit.
Extended terminal base
Povides terminals to connect digital I/O and a communications system.
Standard terminal base
Provides terminals to connect a power supply and analog/digital I/O.

2 - 2 Names and Functions of the Console Unit Display Indicators

Designed to facilitate operations, the SDC40B console unit consists of operation keys, display indicators, and light-emitting diodes (LED), which are described below.


Display panel 2 indicator LEDs
In normal display mode, indicates the meanings of values displayed in display panel 2.
Except for LCK, does not light in control data setting mode
SP : Lights when SP values are displayed
LCK : When LSP values are displayed, lights when:
● LSP modify-prevent is set;
● items that can be viewed only are displayed in the control data setting mode.
Channel display LEDs
In normal display mode, displays control numbers showing the PV, SP and output values of display panels 1 and 2.
Does not light in control data setting mode.
Does not light when operation unrelated to controller is performed.
CH1: Controller 1 (PID1 computational unit)
CH2: Controller 2 (PID2 computational unit)
Instrument mode display LEDs
FLW : Lights in follow mode.
AUT : Lights in auto mode.
MAN : Lights in manual mode.
CAS : Lights in cascade mode.
IM : Lights in interlock manual mode.
Display panel 1
In normal display mode, displays PV values.
In control data setting mode, displays item codes.
Also serves as an alarm code
Display panel 2
In normal display mode, displays SP and output values.
In control data setting mode, displays item codes.
Bar graph display indicator
Displays control outputs in a right-facing bar graph.
Can also be used as an analog/digital data monitor.
FLW
CAS
AUT
MAN
CH1
CH2
IM
SP
LCK
OUT
UF1 UF2 UF3 OT1 OT2 AT FZY
UF1 UF2 DISP
User function LEDs
UF1 : Lights according to UF1 computational expression criteria.
UF2 : Lights according to UF2 computational expression criteria.
UF3 : Lights according to UF3 computational expression criteria.
OUT indicator LEDs
OT1 : During 5G output, always lights.
During 2G output, lights when open relay is on.
OT2 : During 5G output, never lights
During 2G output, lights when close relay is on.
Control mode indicator LEDs
AT : Flashes during auto-tuning.
Lights during smart tuning.
FZY : Lights when disturbance suppressing PID constants are used
Flashes during fuzzy changeover
Bar graph display indicator LED
OUT : Lights when the bar graph displays control output.
Display panel 3
In the normal display mode, displays an auxiliary indication differentiating between LSP and RSP values when display panel 2 displays SP values.
In the control data setting mode, serves as an auxiliary display for item codes appearing in display panel 1.
When values from additional display unit (1 to 4) computations are displayed, serves as an auxiliary display showing numbers 1 to 4.

2 - 3 Names and Functions of Console Unit Keys



UF1, UF2 keys
Selects user-specified items (max. 8).
Can be used with internal signals for computation processing.

MAN
Switches SDC40B to manual mode.

Loader jack*
Jack to connect loader.

AT
Starts and stops auto-tuning.

AUTO
Activates auto mode.

CAS
Activates cascade mode.

DISP
In normal display mode, changes displayed items.
In control data setting mode, restores normal display mode.

[←]、[→]
Cycles through setting items
Moves flashing digit of value currently available for modifying.
In normal display mode, activates LSP setting mode.

[↑]、[↓]
Cycles through setting items
Increases or reduces value currently available for modifying.
In normal display mode, activates LSP setting mode.

PARA
In normal display mode, activates control data (parameter) setting mode.
In control data setting mode, makes value available for modifying.

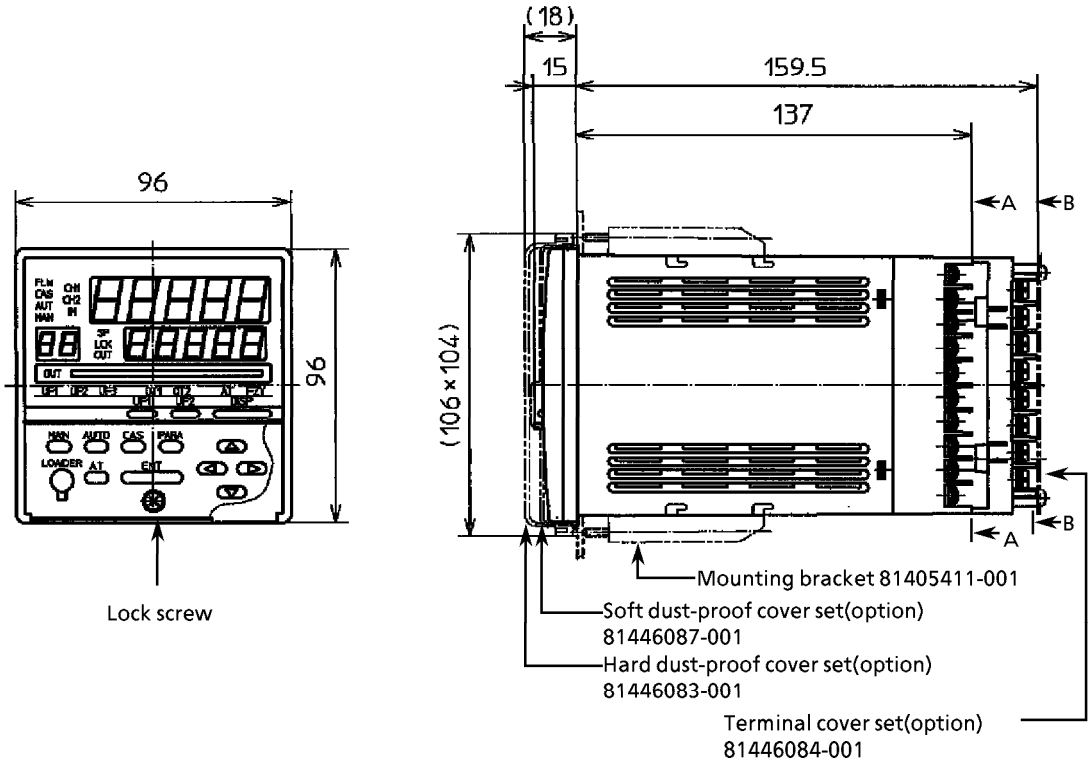
ENT
Activates setting value change
Completes setting value change and writes it to memory.

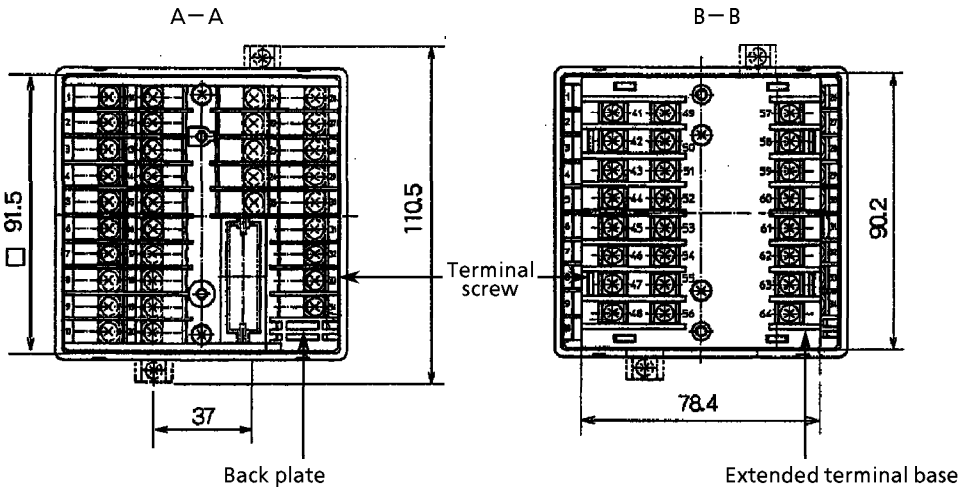
* The loader jack is not isolated from the internal digital circuits. The loader cap must be replaced when the jack is not used.

Chapter3. INSTALLATION

3 - 1 External Dimensions

Unit: mm



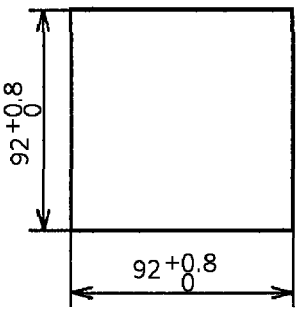


3 - 2 Panel Cutout Dimensions

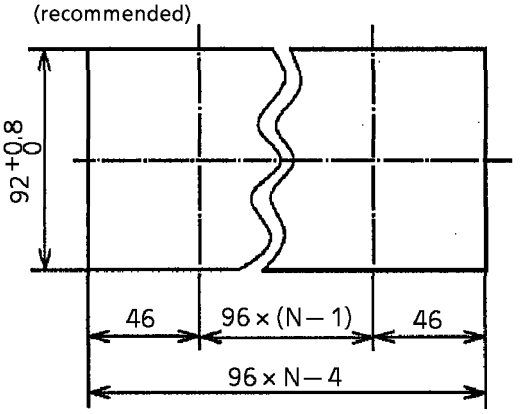
When making the panel, use a steel plate at least 2mm thick.

Unit : mm

Panel cutout dimensions

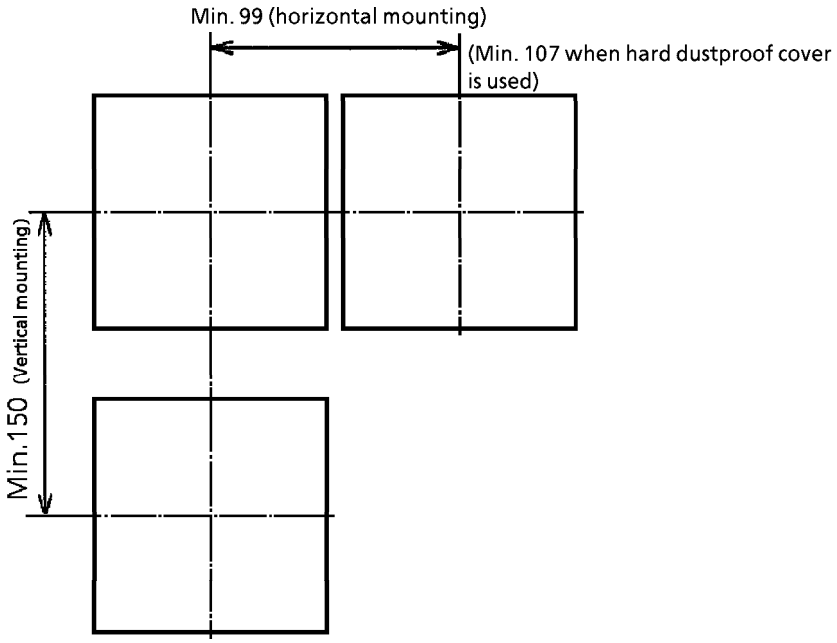


Panel cutout dimensions for contact mounting (recommended)



N = Number of units to be mounted

Panel cutout dimensions for horizontal mounting (recommended)



Handling Precautions When installing, be careful to ensure the operating temperature of the bottom panel of the SDC40B case remains within 0 to 50°C. Be especially careful when performing contact or vertical mounting of unit.

3 - 3 Mounting

⚠WARNING

- Before wiring, or removing/mounting the SDC40B, be sure to turn the power OFF.
  Failure to do so might cause electric shock.
- Do not disassemble the SDC40B.
  Doing so might cause electric shock or faulty operation.

⚠CAUTION

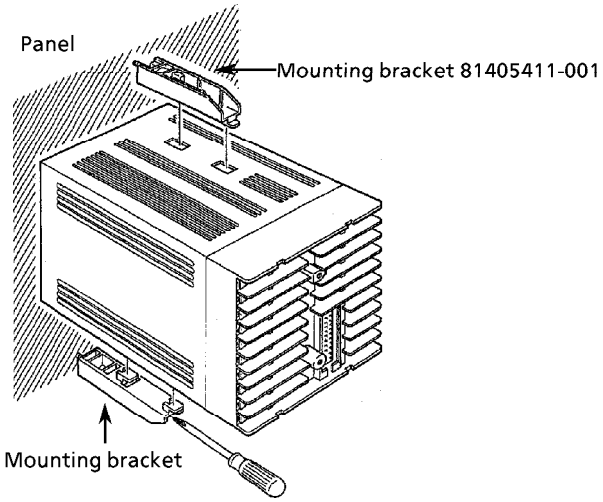
- Use the SDC40B within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.).
  Failure to do so might cause fire or faulty operation.
- Do not block ventilation holes.
  Doing so might cause fire or faulty operation.
- Do not allow lead clippings, chips or water to enter this controller case.
  Failure to do so might cause fire or faulty operation.

■ Location

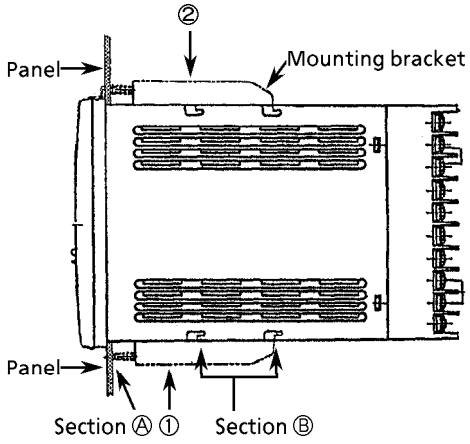
Mount the SDC40B in a location.

- Not subject to extremes in temperature or humidity
- Free of sulfide and other corrosive gases
- With little dust, oily residues, etc
- Not exposed to direct sunlight or weather extremes
- Subject to little mechanical vibration or impact
- Far from high-tension lines, welders, and other electrical noise-generating sources
- 15m or farther from boilers or other equipment with high-voltage ignition devices
- Not subject to strong magnetic fields
- Not subject to flammable liquids or moisture

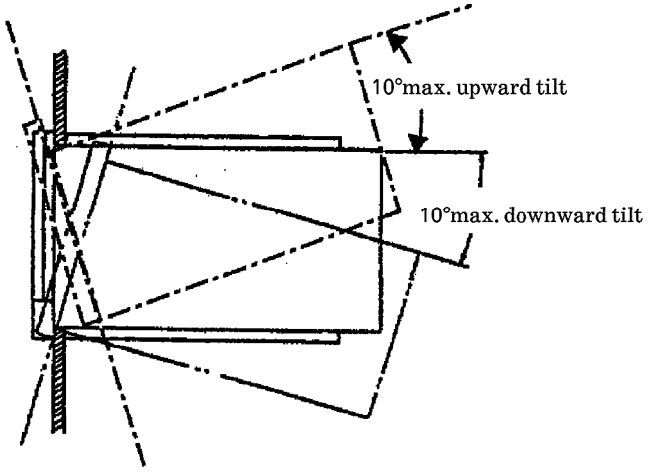
■ Procedure



- Secure top and bottom panels of unit with the provided mounting brackets.
- Mount proceeding from mounting bracket ① on the bottom side.
- Once the sections indicated by Ⓐ and Ⓑ both are snug (no play at front or back of mounting bracket), tighten screws one turn. Be careful: overtightening will deform case.



- Secure unit within 10° of horizontal.



■ Dustproof Cover

Use a dustproof cover (option) when using the controller in a dusty or dirty location, and to prevent inadvertent operation.
Two dustproof covers are provided, hard or soft, each with the following differing functions.

Type	Checking of Display	Operation
Hard	○	X
Soft	○	○

○ indicates that a function can be used.

Chapter4. WIRING

4 - 1 Precautions on Wiring

⚠WARNING

- Ground the FG terminal with a ground resistance of maximum 100 Ω before connecting to the measurement target and external control circuits.
  Failure to do so might cause electric shock or fire.
- Before wiring, or removing/mounting the SDC40B, be sure to turn the power OFF.
  Failure to do so might cause electric shock.
- Do not touch electrically charged parts such as the power terminals.
  Doing so might cause electric shock.

⚠CAUTION

- Wire the SDC40B properly according to predetermined standards. Also wire the SDC40B using specified power leads according to recognized installation methods.
  Failure to do so might cause electric shock, fire or faulty operation.
- Do not allow lead clippings, chips or water to enter this controller case.
  Failure to do so might cause fire or faulty operation.
- Inputs to the current input terminals (31·32 and 28·29) on the SDC40B should bewithin the current and voltage ranges listed in the specifications.
  Failure to do so might cause electric shock or faulty operation.
- Firmly tighten the terminal screws at the torque listed in the specifications.
  Insufficient tightening of terminal screws might cause electric shock or fire.
- Do not use unused terminals on the SDC40B as relay terminals.
  Doing so might cause electric shock, fire or faulty operation.
- We recommend attaching the terminal cover (sold separately) after wiring the SDC40B.
  Failure to do so might cause electric shock.
- Use the relays on the SDC40B within the service life listed in the specifications.
  Continued use of the relays after the recommended service life might cause fire or faulty operation.
- Use Yamatake's SurgeNon if there is the risk of power surges caused by lightning.
  Failure to do might cause fire or faulty operation.

- Before connecting the lines, verify the serial number and terminal numbers on the label affixed to the side panel of the SDC40B. After completing, always double check to ensure all wiring has been performed correctly.
- Use power lines of 90 V or greater capacity for the I/O signal lines and the communications lines, and maintain at least 50 cm between them and the power supply line.
- Make sure that no crimp-style solderless wire connectors are touching an adjacent terminal or connector.
- When connecting a thermocouple input of the SDC40B to another instrument, make sure the instrument's input impedance totals at least 1MΩ. If less than 1MΩ, the SDC40B may not be able to detect sensor disconnection.
- Cautions when using data input devices in combination
  Input of the SDC40B input or output (connected in parallel for input) to an A/D converter, analog scanner, etc., may cause dispersion of the read data. To prevent dispersion, take one of the following corrective measures:

  Corrective measures
  1. Use a low-speed integral A/D converter.
  2. Insert an isolator with no switching power supply between the SDC40B and the A/D converter.
  3. Perform averaging with a personal computer when the data is read
  4. If the device permits, insert an input filter.
- Devices and systems to be connected to this unit must have the basic insulation sufficient to withstand the maximum operating voltage levels of the power supply and input/output parts.
- Use power supply with reinforced insulation for DC model.

The following table shows the meaning of the symbols in the terminal wiring label on the instrument side:

Symbol	Description
	Alternating current
	Direct current
	Earth (ground) terminal
	Caution, risk of electric shock
	Caution

4 - 2 Recommended Cables

To perform thermocouple input, connect a thermocouple element to the terminals. When the wiring distance is long or when connecting the thermocouple without the element to the terminals, connect via shielded compensating lead wires.

📖 NOTE

- For I/O other than thermocouple, use instrument cable for JCS4364 shielded instruments or equivalent. (general name: twisted shield wire for instrument use)
  Recommended wire types.

Fujikura, Ltd.	2-wire	IPEV-S-0.9mm^2×1P
	3-wire	ITEV-S-0.9mm^2×1T
Hitachi Cable, Ltd.	2-wire	KPEV-S-0.9mm^2×1P
	3-wire	KTEV-S-0.9mm^2×1T

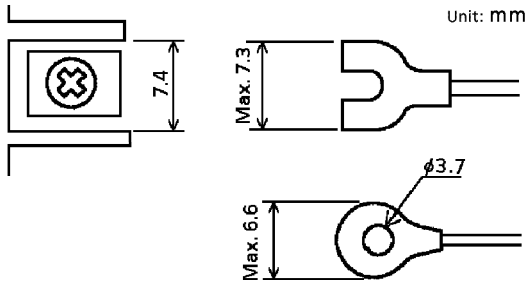
- A shielded multicore microphone cord (MVVS) can be used if electromagnetic induction is low.

4 - 3 Making Terminal Connections

⚠CAUTION

- Firmly tighten the terminal screws at the torque listed in the specifications. Insufficient tightening of terminal screws might cause electric shock or fire.
- Do not use unused terminals on the SDC40B as relay terminals. Doing so might cause electric shock, fire or faulty operation.
- We recommend attaching the terminal cover (sold separately) after wiring the SDC40B. Failure to do so might cause electric shock.

To connect a line to the terminals, use crimp-style solderless wire connectors that fit an M3.5 screw.



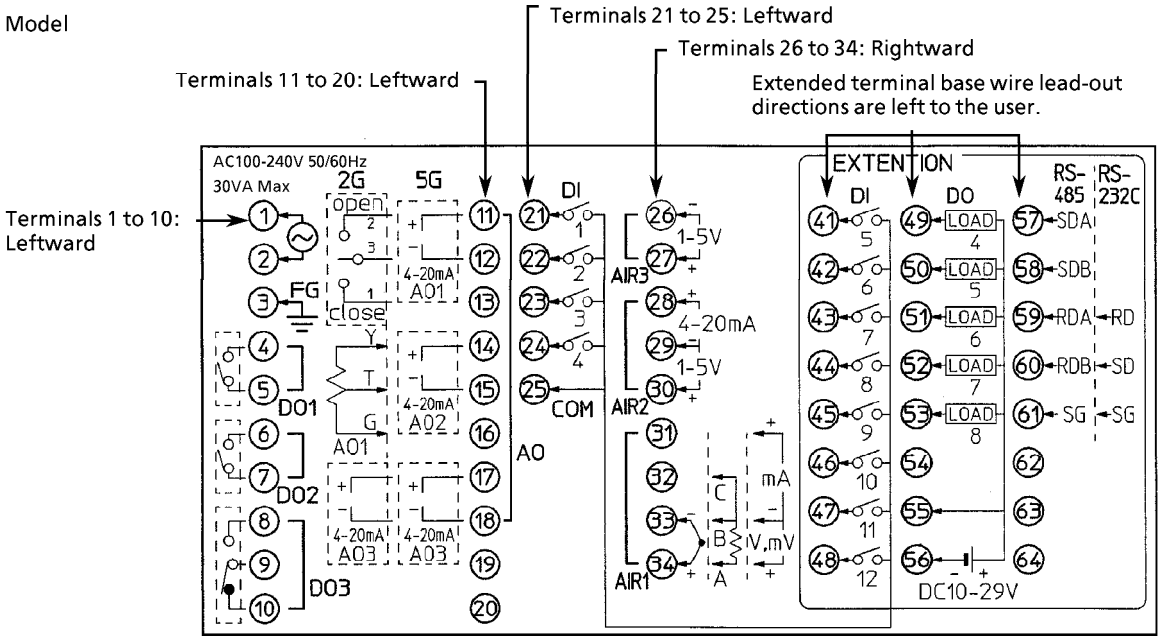
Handling Precautions

- If the SDC40B is mounted in a location subject to noticeable vibration or impact, be sure to use round (closed-end) crimp-style solderless wire connectors to prevent lines from becoming disconnected from the terminals.
- Be careful not to allow any of the crimp-style solderless wire connectors to touch adjacent terminals or connectors.
- The recommended tightening torque for the terminal screws is 0.78 to 0.98N·m.

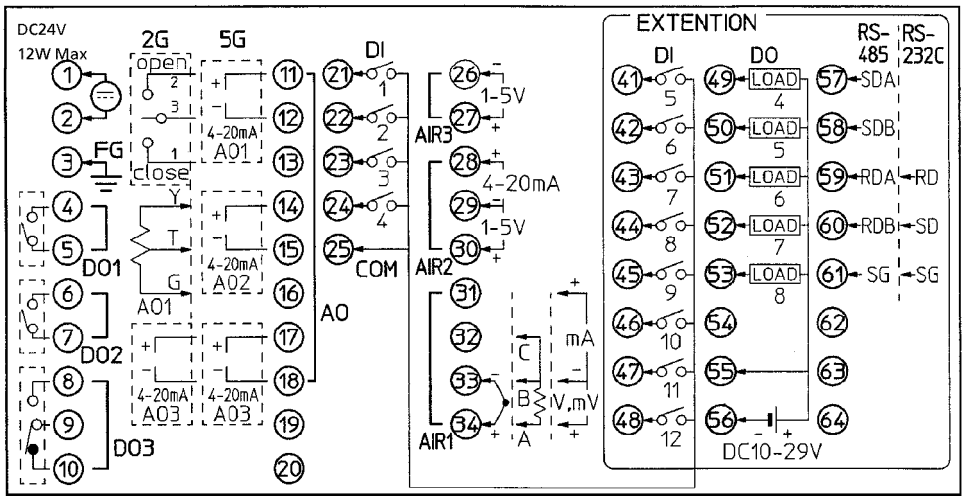
4 - 4 Terminal Layout and Recommended Wire Lead-out Directions

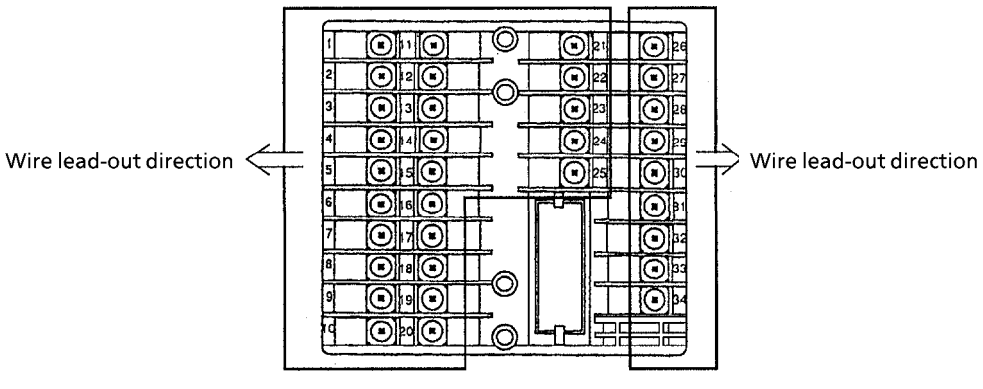
Wires are connected to both the standard terminal base and the extended terminal base. The recommended wire lead-out directions from the standard terminal base are shown below.
Observe these reference standards for wire lead-out directions when using the extended terminal base as well.

● AC Model



● DC Model

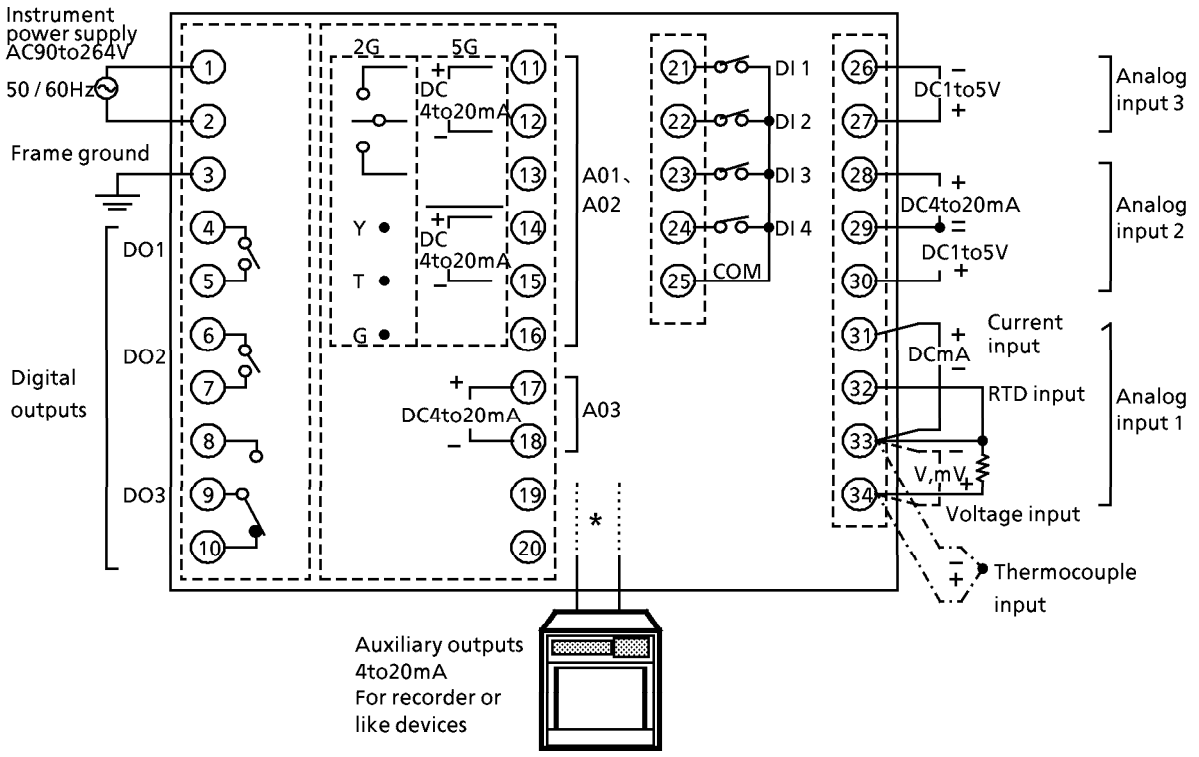




4 - 5 Wiring Diagrams of Standard and Extended Terminal Bases

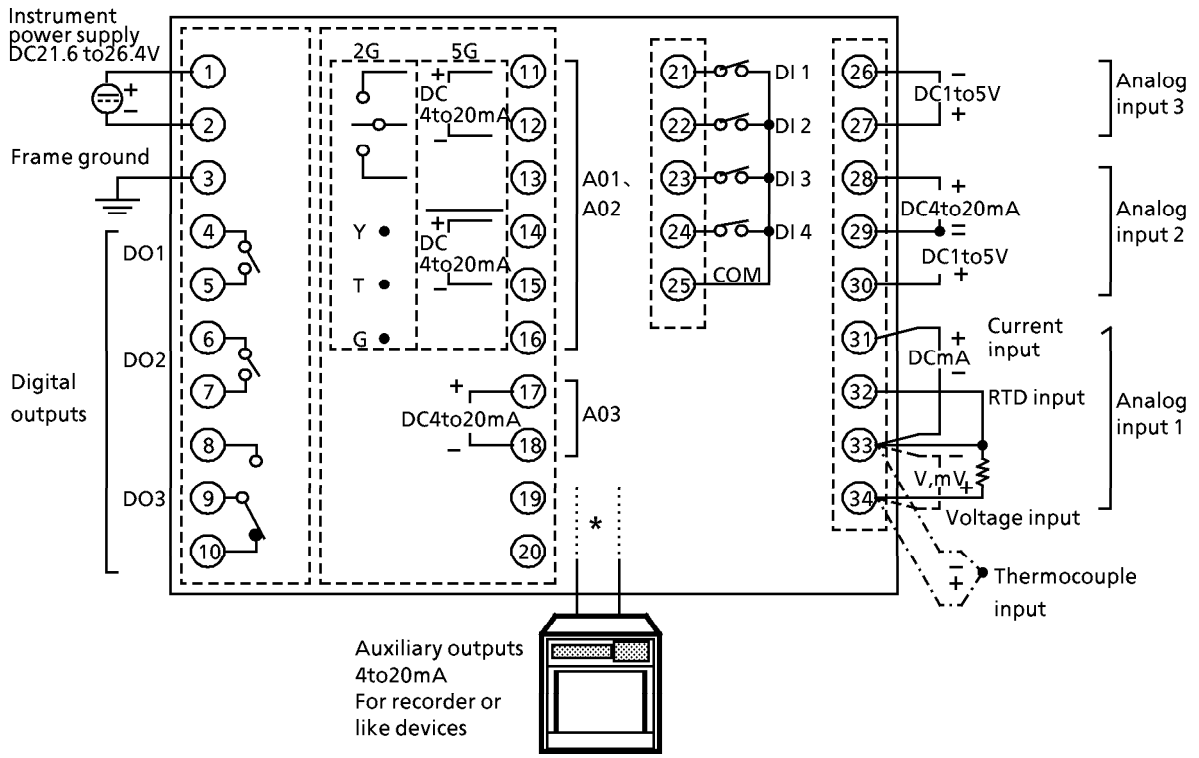
■ Layout of standard terminal

● AC Model



* On the 2G model, the auxiliary output is on terminals 17 and 18.
On the 5G model, the auxiliary outputs are on terminals 14 and 15, and 17 and 18.

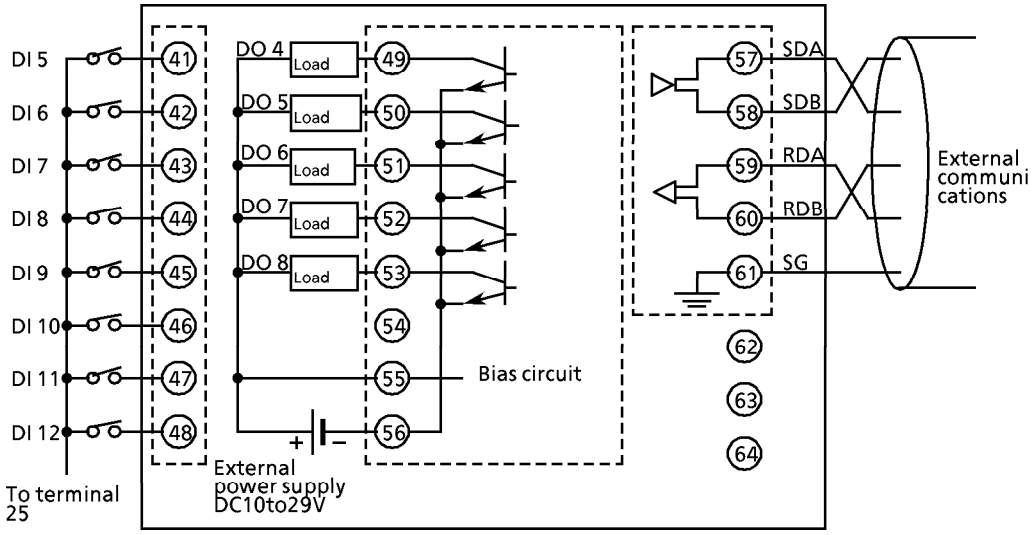
● DC Model



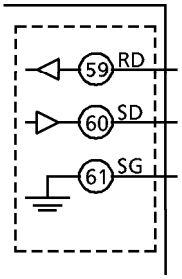
* On the 2G model, the auxiliary output is on terminals 17 and 18.
On the 5G model, the auxiliary outputs are on terminals 14 and 15, and 17 and 18.

■ Layout of extended terminal

●With the RS-485 communications interface



● Using the RS-232C communications interface

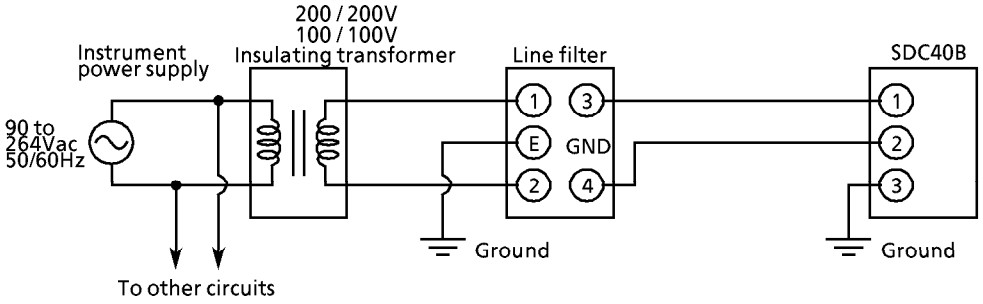


4 - 6 Connecting the Power Supply and Grounding

■ Power supply

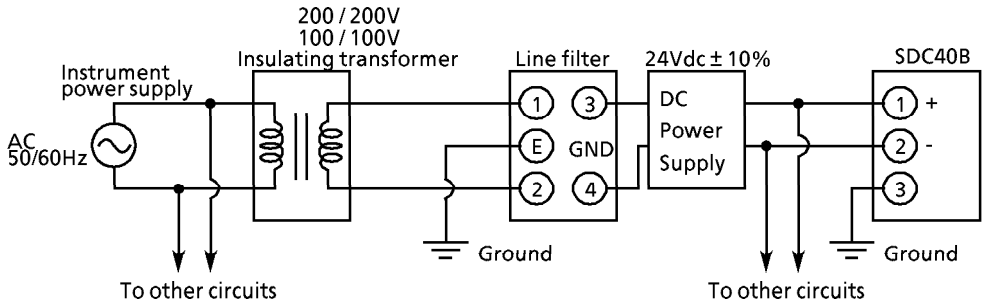
● AC Model

To supply power to the SDC40B, use an instrument-dedicated single-phase power supply subject to minimal electrical interference.



● DC Model

Connect the SDC40B DC model to a 24Vdc ± 10% power source.



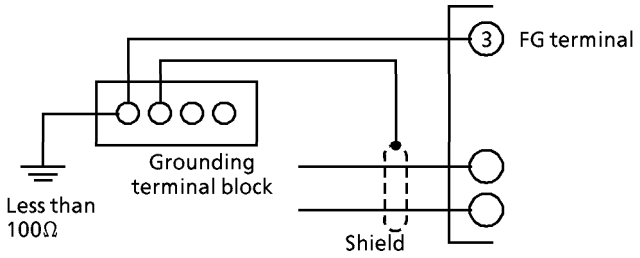
Handling Precautions

- If electrical interference proves excessive, we recommend adding an insulating transformer and / or using a line filter.
  Line filter Yamatake Parts No. 81446364-001
- After carrying out interference reducing measures, do not bundle the primary and secondary power supply coils together or insert them in the same conduit or duct.

■ Grounding

To ground the SDC40B, connect the GND (FG) terminal (terminal 3) to a single ground point without jumpering. If grounding the shield wire or other lines proves difficult, ground them separately to a grounding terminal block.

Type : Less than 100Ω
Conductor : Annealed copper wire, min. 2 mm^2 (AWG14)
Max. Length : 20m



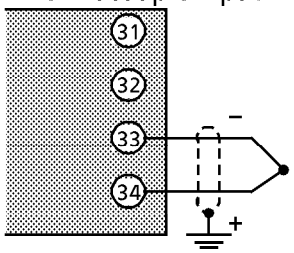
Handling Precautions To ground the SDC40B, connect the GND (FG) terminal (terminal 3) to a single ground point without jumpering.

4 - 7 Connecting the Analog Inputs

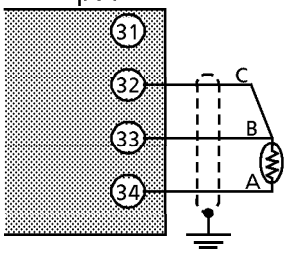
■ Connecting input1

Input 1 is a multi-input type analog input for sensors. Connect as shown below, according to the type of sensor being used.

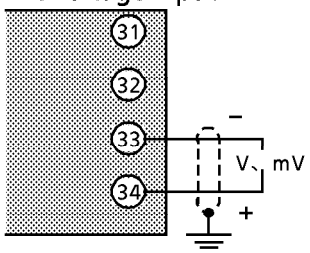
- Thermocouple input



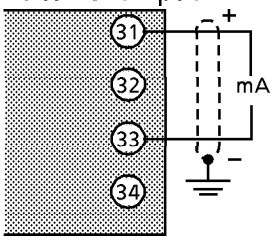
- RTD input



- DC voltage input



- DC current input

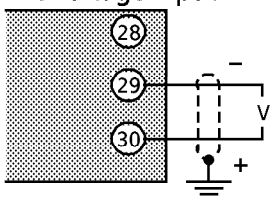


Handling Precautions
- Do not apply voltage across DC current input terminals 31 and 32. Doing so causes the SDC40B to malfunction.
- Be careful to connect the input polarities correctly.
- Use shielded cable to connect the input.
- When using thermocouple input, be sure the terminals are not exposed to moving air. If might cause measurement error.

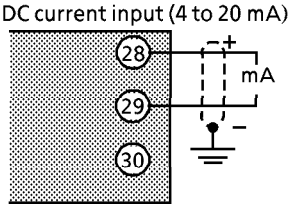
■ Connecting input 2

To connect input 2, connect an input of either 1 to 5 V DC or 4 to 20mA DC to the SDC40B as shown below.

- DC voltage input



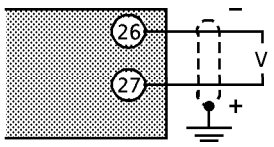
- DC current input (4 to 20 mA)



Handling Precautions
- Do not apply voltage across DC current input terminals 28 and 29. Doing so causes the SDC40B to malfunction.
- Be careful to connect the input polarities correctly.
- Use shielded cable to connect the input.

■ Connecting input 3

To connect input 3, connect an input of 1 to 5V DC to the SDC40B as shown below.



Handling Precautions
- Be careful to connect the input polarities correctly.
- Use shielded cable to connect the input.
- Be aware that inputs 2 and 3 are not isolated.
- For 4-20mA input, convert the input to 1-5V using a 250Ω resistor, such as model No, 81401325 with ±0.02% accuracy or 81446642-001 with ±0.05% accuracy.

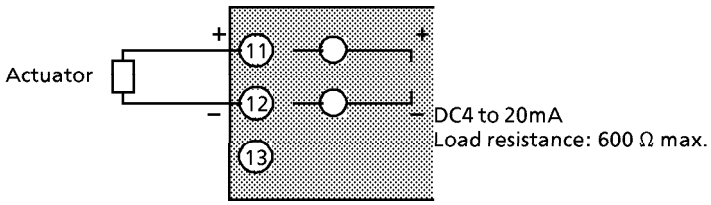
4 - 8 Connecting the Control Output (Analog Output 1)

⚠WARNING

- ALWAYS TURN OFF POWER TO THE SDC40B BEFORE ATTACHING OR REMOVING THE ACTUATOR.

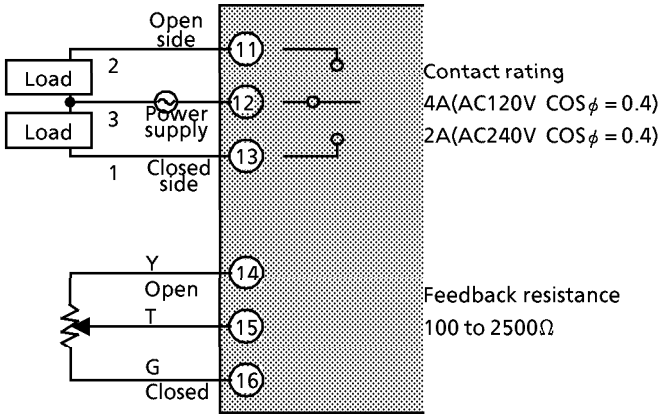
■ Using current output (5G)

Connect the current output 5G as shown below.



■ Using position proportional output (2G)

Paying careful attention to the open/close orientation of the switch, connect as shown below.



Handling Precautions

- The built-in relay has a limited service life. Avoid setting PID constants such that the relay opens and closes repeatedly.
- When using a 100/200 V AC motor, in addition to the contact rating, exercise caution with respect to the inrush current. Use an external auxiliary relay if necessary.
- Maintain at least 30cm between the lines connecting the motor terminals (11, 12, 13) and the feedback resistance terminals (14, 15, 16)
  (Do not insert the lines in the same duct or use six-wire cable. Doing so may cause the SDC40B to malfunction due to electrical interference when starting up the motor.)
- Terminals 14, 15, and 16 need not be connected if there is no feedback resistance.

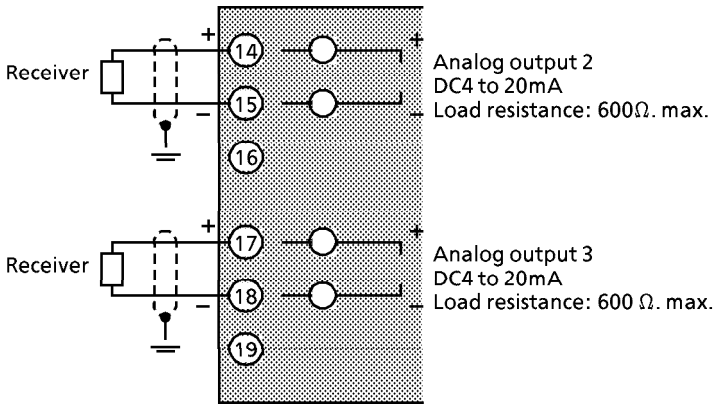
4 - 9 Connecting the Auxiliary Outputs(Analog Output 2,3)

⚠WARNING

- ALWAYS TURN OFF POWER TO THE SDC40B BEFORE ATTACHING OR REMOVING THE ACTUATOR.

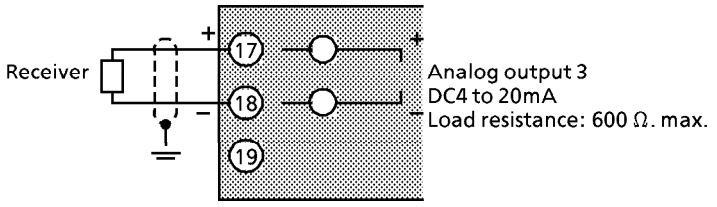
■ Auxiliary output of control output 5G

Handling Precautions Use shielded cable.



■ Auxiliary output of control output 2G

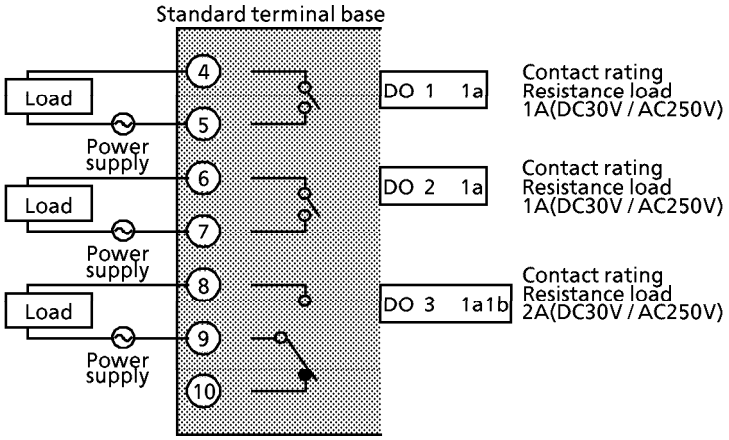
Handling Precautions Use shielded cable.



Control output 2G is not equipped with analog output 2.

4 - 10 Connecting the Relay Digital Outputs

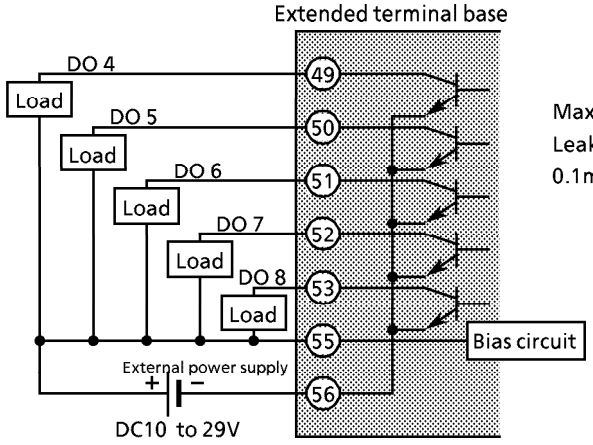
Digital outputs 1 to 3 are relay-type digital outputs: DO1 and DO2 are 1a contact, and DO3 is a 1a1b contact relay. They connect to the standard terminal base.



Handling Precautions When switching a small current, connect a bleeder resistance to obtain a current greater than that of the minimum switching capacity of the relay.

4 - 11 Connecting the Open Collector Digital Outputs

Digital outputs DO4 to DO8 are open collector-type. They connect to the extended terminal base.



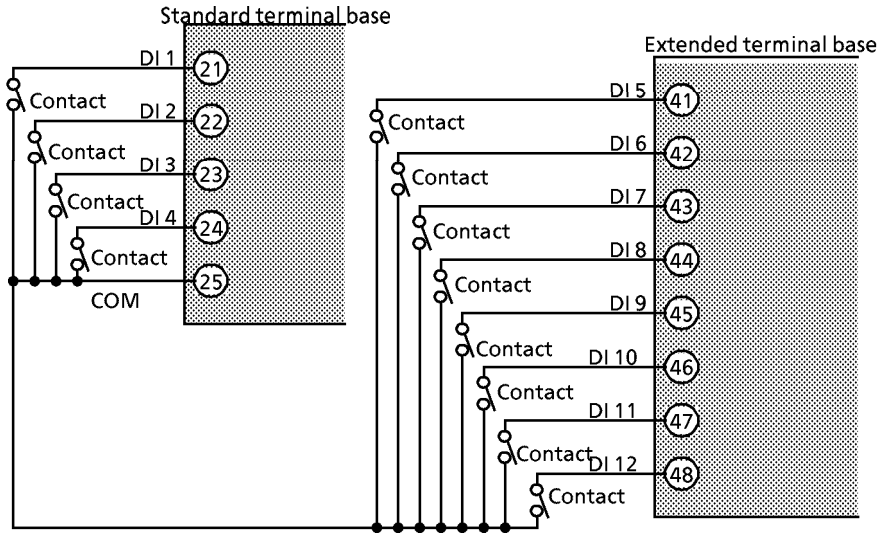
Max. load current: 70mA/output
Leakage current at shutoff:
0.1mA or less

Handling Precautions

- Always connect terminal55 to the positive (+) terminal of the external power supply. Failure to do so renders the open collector digital outputs inoperative.
- Do not short circuit the positive (+) terminal of the external power supply to terminals49 to 53 on the SDC40B. Doing so causes the open collector digital outputs to malfunction.
- When connecting a semiconductor load such as a programmable controller (sequencer), select a module in which the current directions match.
  Use one made inoperative by the leakage current produced when the digital outputs are shut off.

4 - 12 Connecting the Digital Outputs

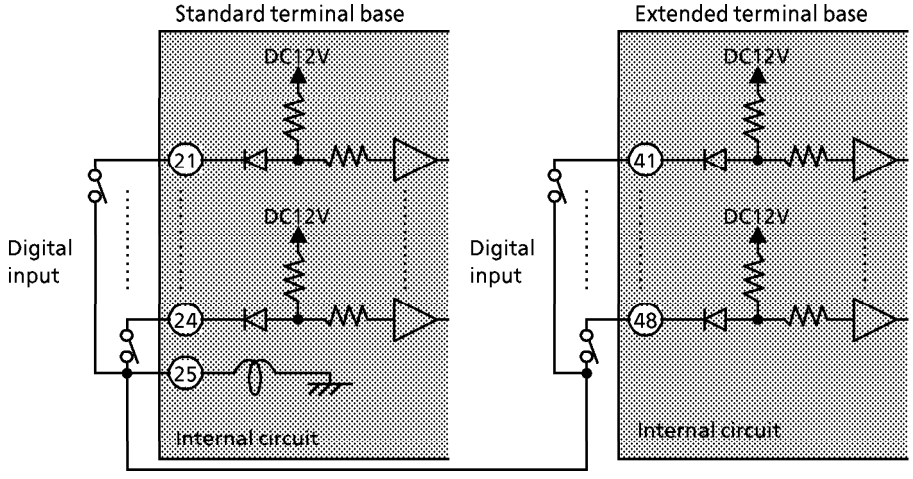
The SDC40B is equipped with 12 digital inputs (DI). Eight of these are provided on the extended terminal base. To wire, connect across both the standard terminal base and the extended terminal base.



Handling Precautions

- The digital inputs on this unit are provided with a built-in power supply (open voltage type, 12V). Always use no-voltage contacts externally.
- For the no-voltage contacts, use gold contacts or other relays that switch on small currents. Other types of relay contacts may not switch. Use contacts that have ample margin over the minimum switching capacity with respect to the current and open voltage ratings of contacts provided on the SDC40B.
- If using semiconductors (open collectors, etc.) as no-voltage contacts, use one that maintains a potential of no more than 3V across the contacts when actuated, and a leakage current of no more than 0.1mA when shut off.
- The digital inputs (remote switch inputs) of all SDC40 series units (SDC40A, SDC40B, and SDC40G) can be connected in parallel. If connecting them in parallel to another instrument, carefully check the requirements of the other instrument before proceeding.

● Cut-out diagram of the SDC40B internal circuits that connects the digital inputs

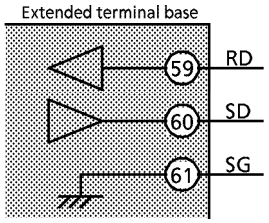


4 - 13 Connecting the Communications Interface

Depending on the model, the SDC40B is equipped with either an RS-232C communications interface or an RS-485 communications interface.

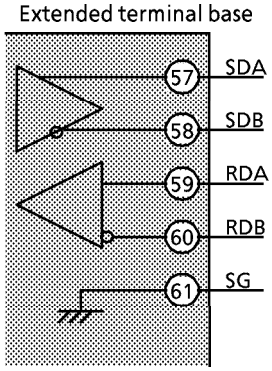
Handling Precautions The SDC40B operates as a slave station.

■ Connecting to an RS-232C communications interface



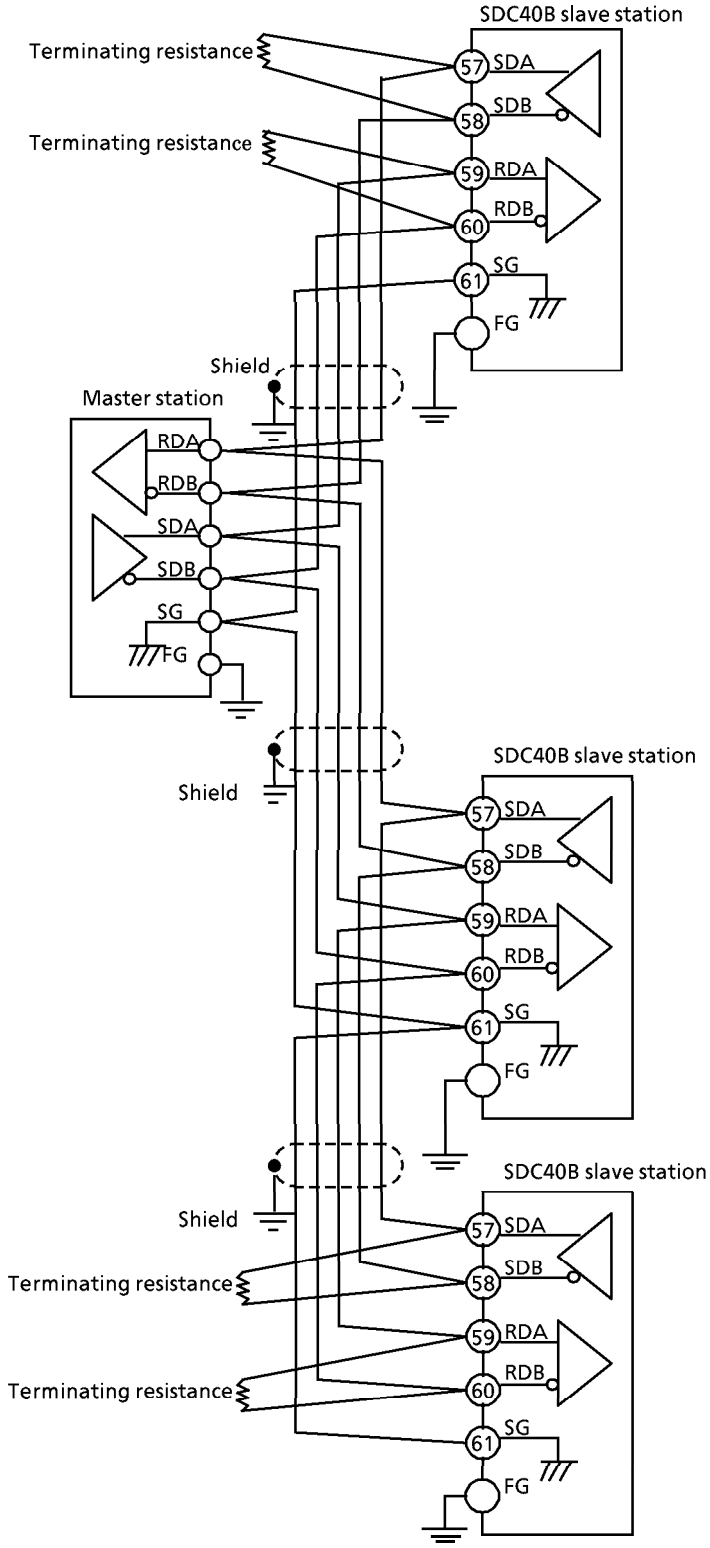
Handling Precautions
- Connect the slave station to the master station in a single-drop (point-to-point) configuration.
- The slave station cannot be connected in a multi-drop configuration.
- Set the slave station address to a number other than 0.

■ Connecting to an RS-485 communications interface



Handling Precautions
- The slave station can be connected in a multi-drop configuration.
- Always set a unique address to each slave station.
- Attach terminating resistances (a total of four when connecting a 5-wire system) to the ends of the communications lines. Use 0.5W or greater terminating resistances of 150Ω ± 5%.
- If connecting three lines, short circuit terminals 57 and 59, and 58 and 60.
- Do not short circuit the RDA to RDB and SDA to SDB terminals.

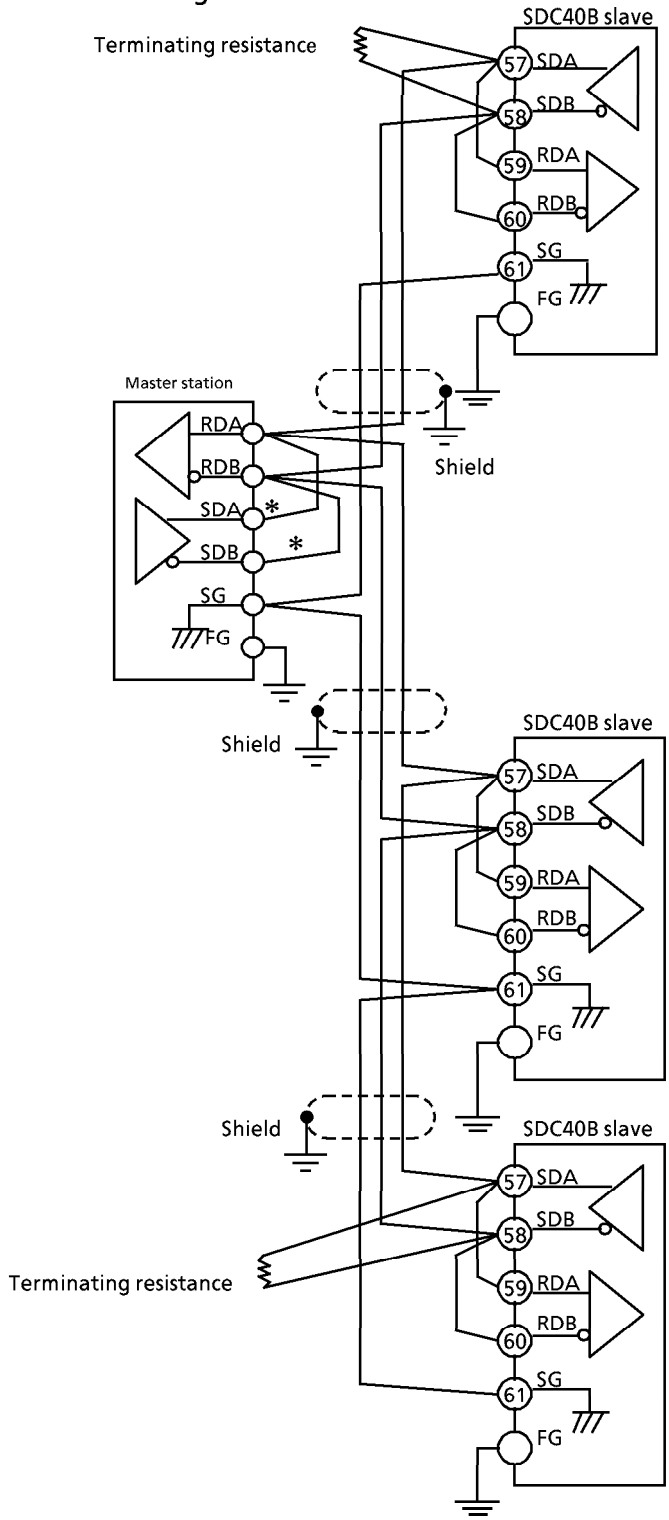
● RS-485 5-wires system interconnection diagram



Handling Precautions ● Be sure to connect SG terminals each other. Failure to do so might cause unstable communications.

Attach 0.5W or greater terminating resistances of 150Ω ±5% at each end of the communications lines. Ground the shield FGs at one end in one location, not at both ends.

● RS-485 3-wires system interconnection diagram



Handling Precautions

- Be sure to connect SG terminals each other. Failure to do so might cause unstable communications.

Attach 0.5W or greater terminating resistances of 150Ω ±5% at each end of the communications lines. Ground the shield FGs at one end in one location, not at both ends.

4 - 14 Corrective measures

■ Sources of electrical interference

The following list notes common sources of electrical interference:

① Relays and contacts
② Solenoid coils and valves
③ Power lines (esp. those carrying more than 90V)
④ Inductive loads
⑤ Impedances
⑥ Motor commutators
⑦ Phase angle control SCR
⑧ Wireless communications equipment
⑨ Welding irons
⑩ High-voltage ignition devices

■ Electrical interference suppression measures

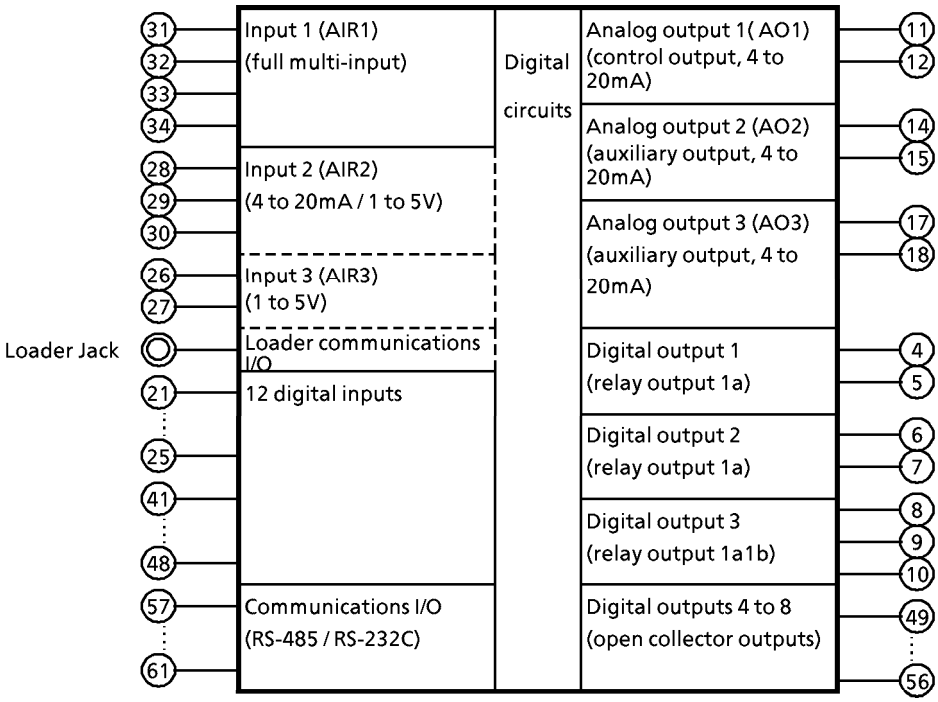
- Use a CR filter to suppress fast-rising interference.
  Recommended CR filter: Yamatake Parts No.81446365-001

- Use a varistor to suppress high-amplitude interference.
  However, exercise caution when using a varistor as it short circuits upon malfunctioning.
  Recommended varistors:
  Yamatake Parts No. 81446366-001 (for 100V)
  81446367-001 (for 200V)

4 - 15 Isolating Inputs and Outputs

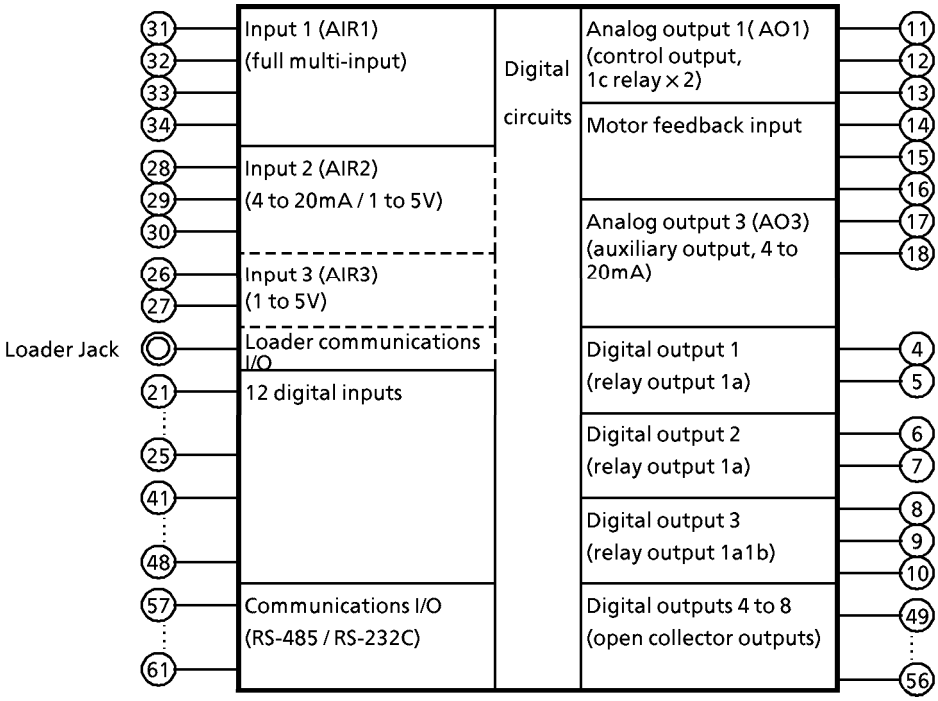
The internal isolation of inputs and outputs on the 5G and 2G models is shown below. In these figures, the solid lines enclose mutually-isolated sections. Those sections bounded by dashed lines are not isolated.

■ Control output 5G



Handling Precautions The loader jack unit is not isolated from the digital circuits. The loader cap must be replaced when the jack is not used.

■ Control output 2G



Handling Precautions The loader jack unit is not isolated from the digital circuits. The loader cap must be replaced when the jack is not used.

Chapter5. FUNCTIONS AND SYSTEM CONFIGURATION

5 - 1 Outline of Functions

DIGITRONIK SDC40B operations can be divided into the three following types of functions:

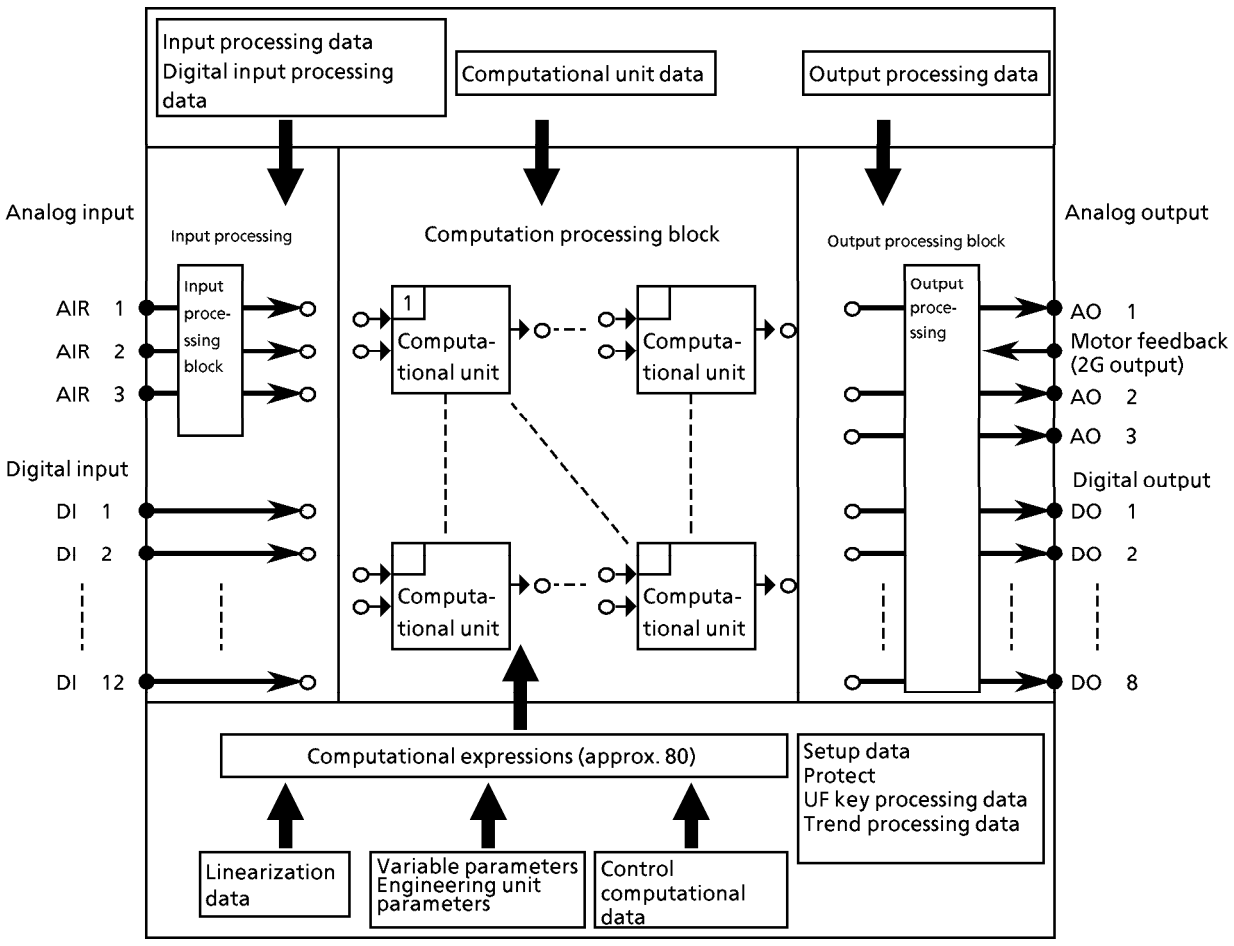
- Input processing functions
- Computational processing functions, and
- Output processing functions

Each of these basic types of functions has its own built-in, specialized processing functions that allow SDC40B users to select the processing that suits their applications and individual instrumentation specifications.

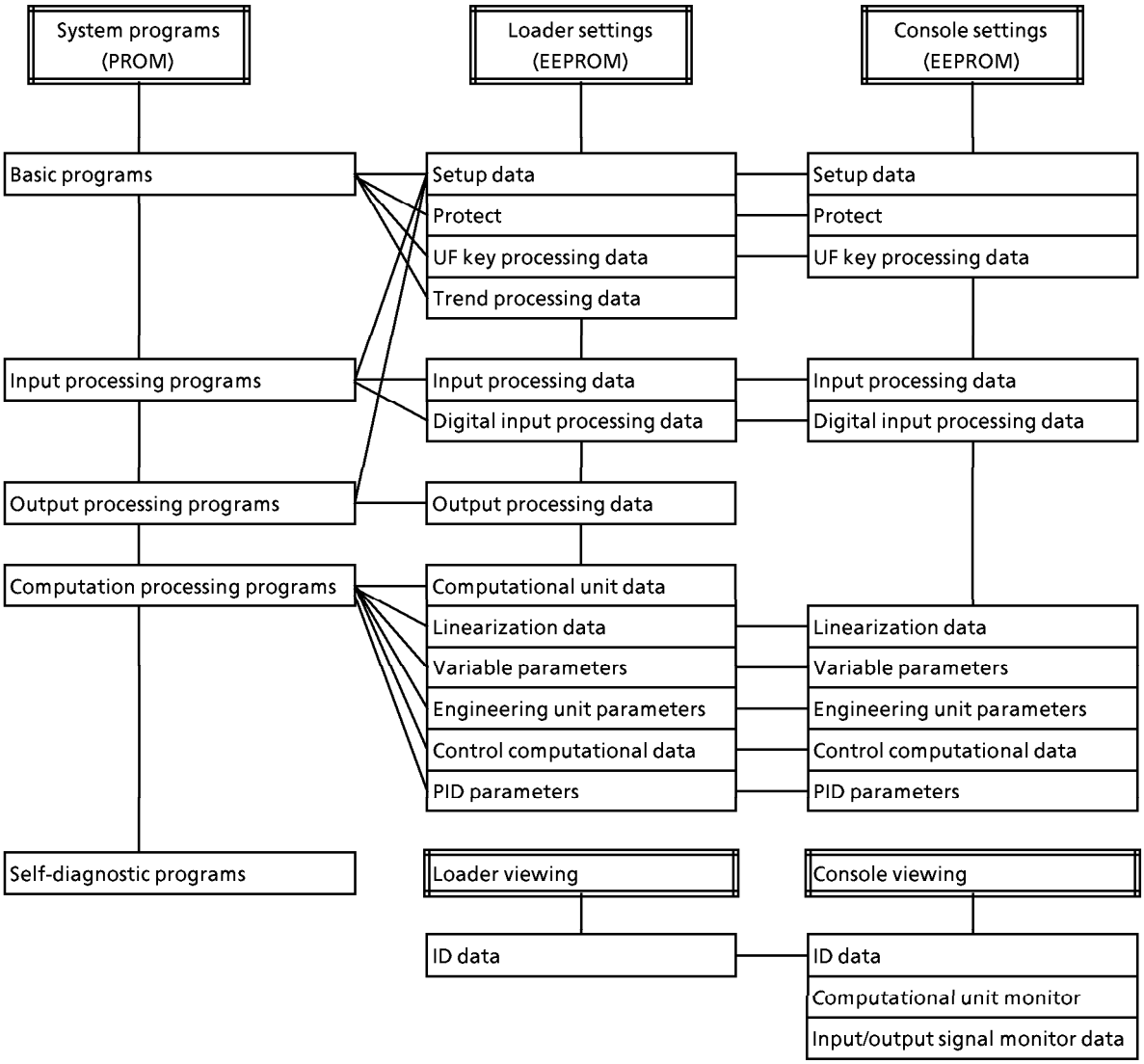
The SDC40B's computational processing functions consist of 50 computation processing blocks called "Computational units". These computational units are assigned a total of 80 types of computational expressions (described in Chapter 6. COMPUTATIONAL EXPRESSIONS), and are interconnected in a configuration that enables them to execute a variety of computation control functions.

Data used to select the different computations is called "Configuration data" and is divided into the categories shown on the following page. "Configuration data" is written to the SDC40B's memory(EEPROM) by the loader. In addition to "Configuration data" there is "Monitor data", used to monitor actual system input and output.

The figure below shows the relationship between Configuration data and the various processing units. The figure on the following page shows the relationships between the SDC40B's internal programs and computational data. System programs are stored in the SDC40B's system PROM. Configuration data, generated according to instrumentation specifications in the loader, is stored in the SDC40B's EEPROM. Configuration data that requires updating, such as operation conditions data, is updated from consoles as required during operation and retained in the EEPROM, even when power outages occur.

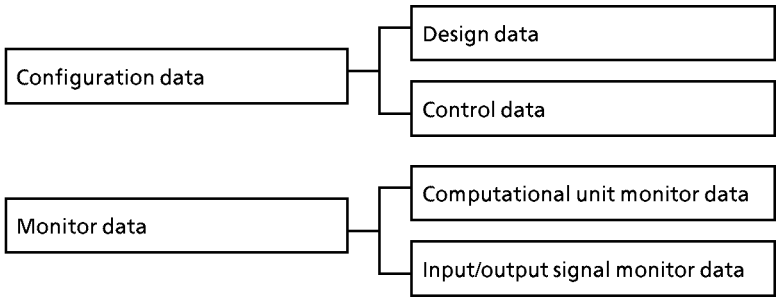


- Program configuration



5 - 2 Types of System Data

The SDC40B's system data is arranged according to the following categories:



- **Design data**

  "Design data" is divided into the computational unit data and output processing data categories. The former specifies types of computational expressions and the connection configurations for computational units and the latter specifies the types of signals to be output.
  These data types can be set only from a personal computer (PC) loader, they cannot be set or viewed from the system console.

- **Control data**

  "Control data" is mainly used for computation processing.
  It can be set from both the loader and console, although certain types can be viewed only.
  Trend processing data is set by the PC loader, and cannot be set or viewed from system consoles.

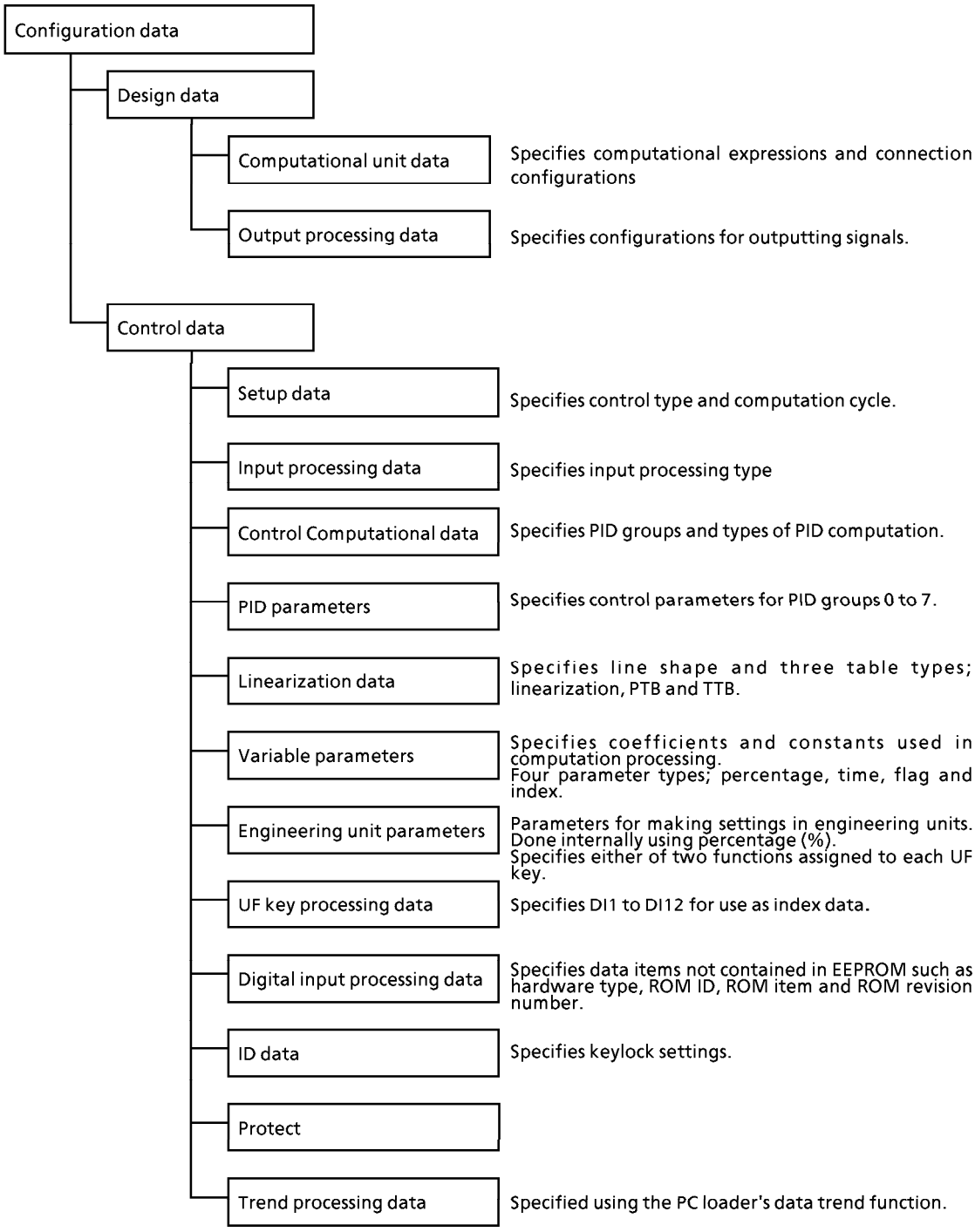
- **Computational unit monitor data**

  Used to monitor actual values being input to computational units, "Computational unit monitor data" is also used for configuration data debugging operations.
  Computational unit monitor data can be viewed from the system console and with the data trend function of the PC loader.

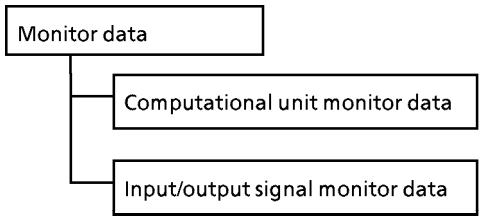
- **Input/output signal monitor data**

  "Input/output signal monitor data" is used to monitor the analog input/output signals, digital input/output signals and PID controller input/output signals. It can be viewed from the system console and with the data trend function of the PC loader.

● Categories of configuration data


Configuration data
Design data
Computational unit data
Specifies computational expressions and connection configurations
Output processing data
Specifies configurations for outputting signals.
Control data
Setup data
Specifies control type and computation cycle.
Input processing data
Specifies input processing type
Control Computational data
Specifies PID groups and types of PID computation.
PID parameters
Specifies control parameters for PID groups 0 to 7.
Linearization data
Specifies line shape and three table types; linearization, PTB and TTB.
Variable parameters
Specifies coefficients and constants used in computation processing.
Four parameter types; percentage, time, flag and index.
Engineering unit parameters
Parameters for making settings in engineering units.
Done internally using percentage (%).
UF key processing data
Specifies either of two functions assigned to each UF key.
Specifies DI1 to DI12 for use as index data.
Digital input processing data
Specifies data items not contained in EEPROM such as hardware type, ROM ID, ROM item and ROM revision number.
ID data
Specifies keylock settings.
Protect
Trend processing data
Specified using the PC loader's data trend function.

● Categories of monitor data



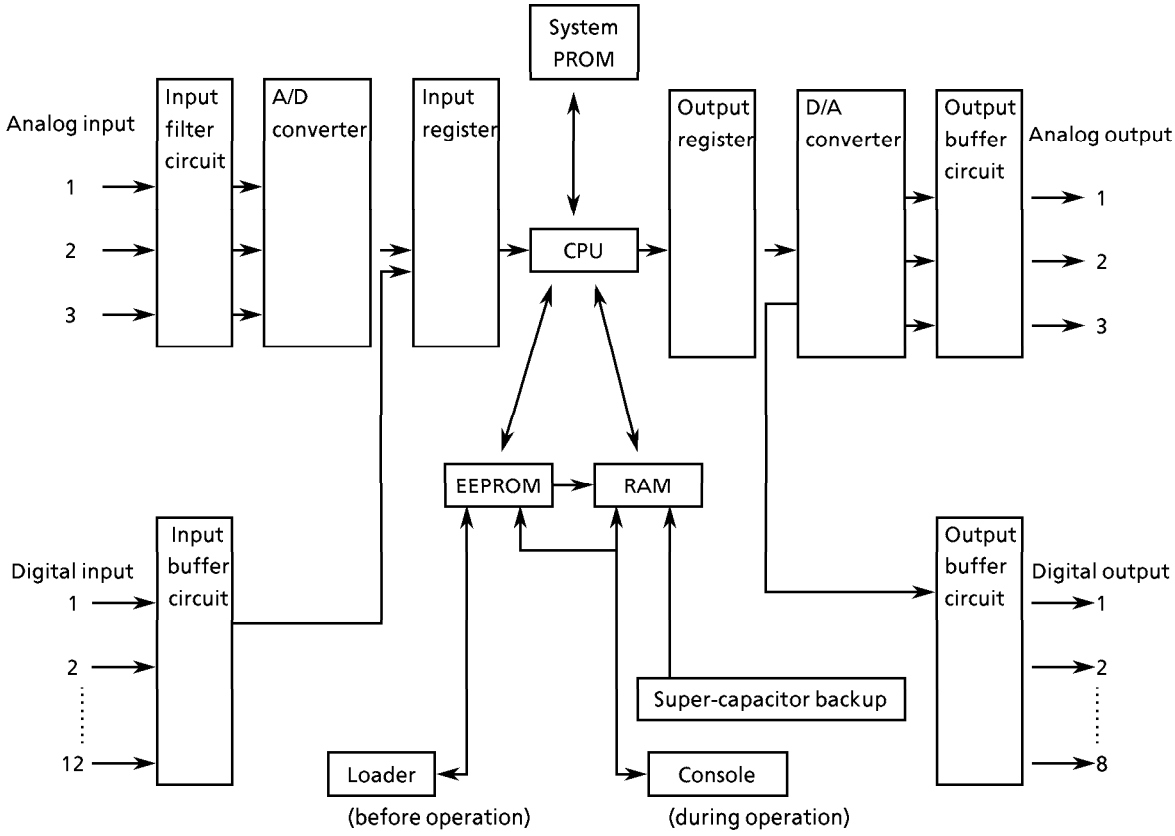
5 - 3 Principles of Operation

Noise in the analog signals is removed by the input filter circuit. The signals then undergo A/D conversion and are stored in the input register. Noise is removed from the digital signals in the input buffer and the input values are then stored in the input register.

The CPU performs computation processing according to system programs, configuration programs and input register data, and outputs results, which are stored in the output register.

Analog signals are output in two forms, current output and position proportional output. After D/A conversion, current output is output in the 4 to 20mA range via the output buffer.

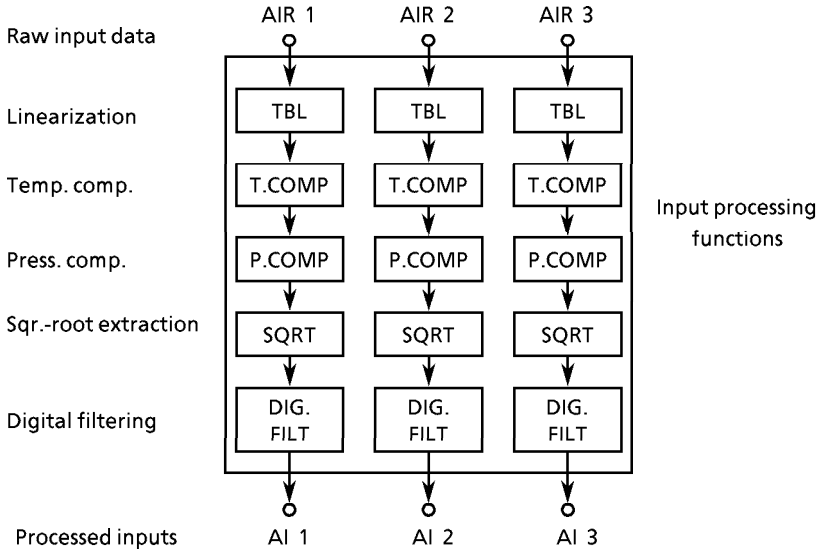
With position proportional output, the CPU compares the output values and motor opening input values and operates the relays (on/off) to ensure they both match.



5 - 4 Input Processing Functions

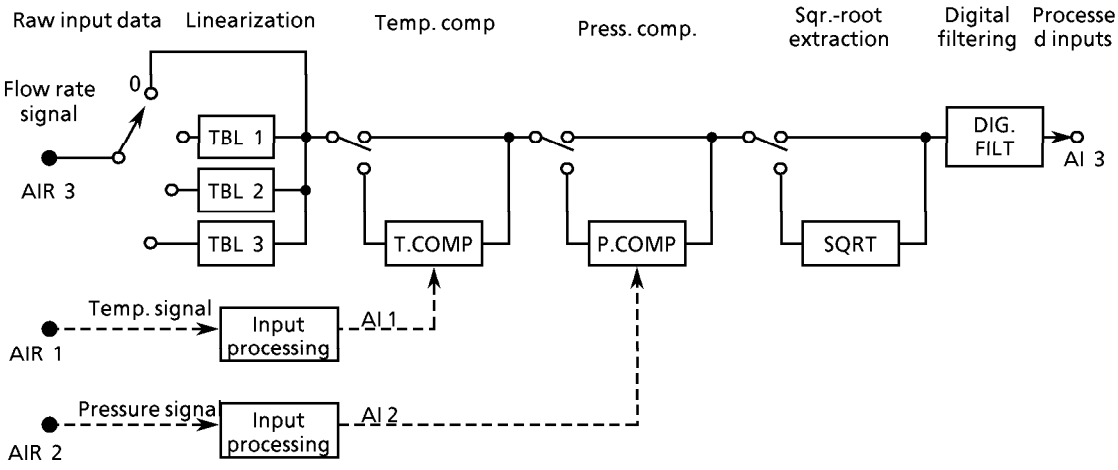
The SDC40B can connect up to three analog input signals having the functions shown below.
Input processing can be inhibited by specifying the not used setting in "Input processing data".

- Example of temperature and pressure compensation



The figure below shows an example of applying temperature compensation and pressure compensation operations to flow rate input signals during the measuring of gas flow rates.
Whether or not processing is enabled and the data settings used for the processing performed by the various input processing functions are determined by "Setup data" and "Input processing data" settings.

- Example of temperature and pressure compensation

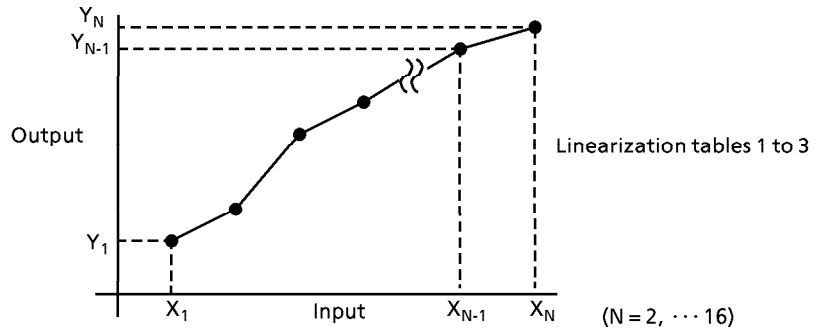


■ Approximation by linearization table(TBL)

Linearization table approximation can be used to express analog inputs AI1 to AI3 in line form.

Three linearization table operations are provided as computational expressions and the table to be utilized is selected according to the computation. A maximum of 16 points can be defined for each linearization table (TBL1 to TBL3).

Two or more linearization tables can be connected in chain format to function as a single table. The definitions for point coordinates (X:input, Y:output) and chain-connections are selected using "Linearization table data" settings which can be modified from the console, even during SDC40B operation.



■ Temperature compensation (T. COMP)

The following expression is used to calculate temperature compensation for the flow rate signal during flow rate measurement:

$$\text{Compensated flow rate signal} = \frac{\text{Design temp. (target temp.) + constant}}{\text{"Current temp." + constant}} \times \text{"Flow rate signal"}$$

As indicated by the expression above and by the example on the preceding page, a current temperature signal is needed to calculate compensation. An analog input number (from 1 to 3) is selected as the temperature compensation input value when making the "Input processing data" setting. Select "0" as the temperature compensation input value if temperature compensation is not being applied

The SDC40B processes the three analog signals ordered from AI1 to AI3.

Temperature signals must be processed prior to flow rate signals. This means earlier numbers must be assigned to temperature signals in order to effectively compensate the temperature of flow rate signals. If the flow rate signal is AI2, for example, the temperature signal must be AI1.

The design temperature (target temp.) is also set using "Input processing data". Temperature compensation can be selected using either of the following two types of engineering units, shown below with their computational constants:

°C : constant = 273.15
°F : constant = 459.7

Current temperature signal settings are also of importance. "Setup data" is used to select the unit (°C or °F) for the temperature signal's AI1 thermocouple range and resistance temperature detector (RTD) range. In this case, the "Input processing data" setting that specifies the engineering unit for temperature compensation for the flow rate signal cannot be set, as it rendered invalid. When the current temperature signal is in the AI1, AI2 and AI3 linear range, set it as the temperature signal by specifying the decimal point position of the displayed measuring unit, the lower limit (0%) and the upper limit (100%) in "Input processing data".

■ Pressure compensation (P. COMP)

The following expression is used to calculate pressure compensation for the flow rate signal during flow rate measurement:

$$\text{Compensated flow rate signal} = \frac{\text{"Current pressure"} + \text{constant}}{\text{Design pressure (target pressure)} + \text{constant}} \times \text{"Flow rate signal"}$$

As indicated by the expression above and by the example on page 5-6, a current pressure signal is needed to calculate compensation. An analog input number (from 1 to 3) is selected as the pressure compensation input value when making the "Input processing data" setting. Select "0" as the pressure compensation input value if pressure compensation is not being applied.

The SDC40B processes the three analog signals ordered as AI1 to AI3.

Pressure signals must be processed prior to flow rate signals. This means that earlier numbers must be assigned to pressure signals, in order to effectively compensate the pressure of flow rate signals. Thus, in a case where both temperature and pressure compensation are applied, assign the temperature signal to AI1, the pressure signal to AI2 and the flow rate signal to AI3.

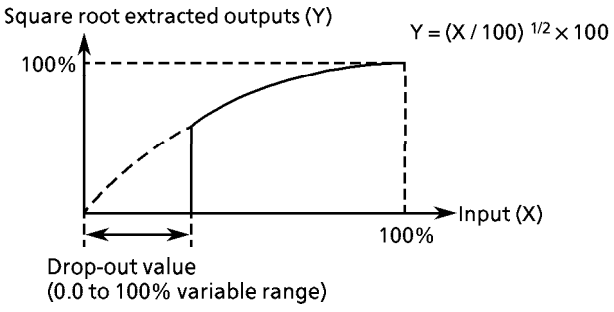
The design pressure (target pressure) is also set using "Input processing data".Pressure compensation can be selected using the following five types of engineering units, which are shown below with their computation constants:

MPa : constant = 0.101325
kPa : constant = 101.325
Pa : constant = 101325
kgf/cm^2 : constant = 1.03323
mmH_2O : constant = 10332.3

Current pressure signal settings are also of importance. Set the pressure signal in the AI1, AI2 and AI3 linear range by specifying the decimal point position of the displayed measuring unit, the lower limit (0%) and the upper limit (100%) in "Input processing data". Do not set the pressure signal in the AI1 thermocouple range and resistance temperature detector (RTD) range.

■ Square root extraction (SQRT)

The differential pressure measured at the orifice of a differential pressure flow meter is normally directly proportional to the second power of the flow rate signal, so square root extraction is used to calculate fractional signals when required. Whether or not square root extraction is applied is specified in "Input processing data". Square root extraction comes with a drop-out function, which outputs 0% when the square root extraction input falls below the drop-out value set in the "Input processing data".



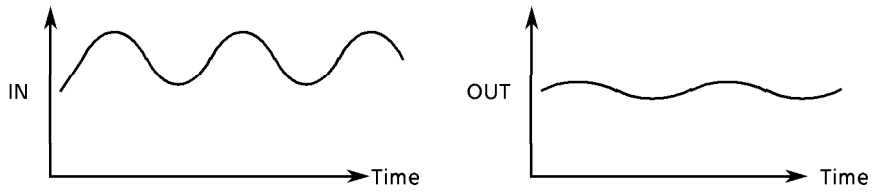
■ Digital filtering (DIG.FILT)

The digital filter is used to remove the process noise that gets impressed on the input signal. As shown in the expression below, the digital filter is based on the following primary delay operation:

$$\text{Output} > \frac{1}{1+T\times S} \times \text{Input}$$

T:filter constant
S:Laplacian

The filter constant is set using "Input processing data" settings. Entering 0.0s as the constant disables digital filter operation.

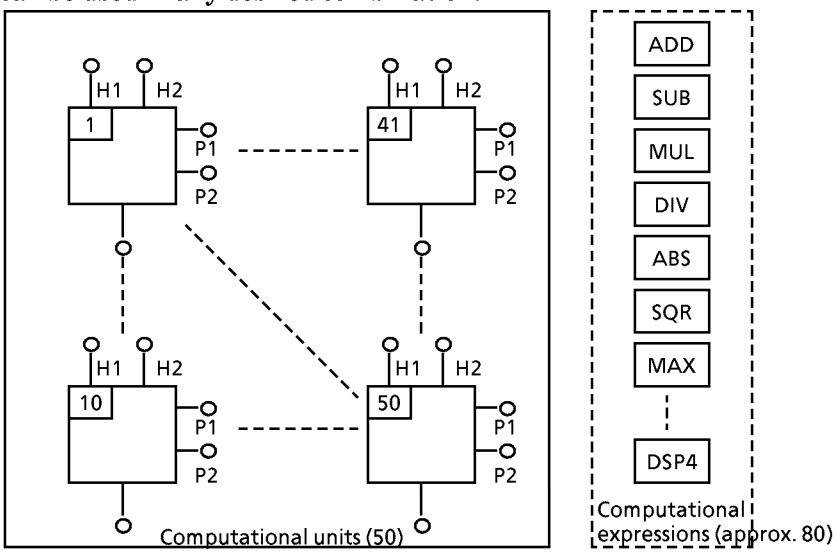


Handling Precautions

- The engineering units that can be used for processed inputs (AI1 to AI3) are limited to the -10.0 to + 110.0% range.
- Temperature and pressure compensation computations are calculated using values expressed as engineering units.

5 - 5 Computational Processing Functions

The SDC40B contains 50 computational units capable of executing approximately 80 computational expressions that can be used in any desired combination.



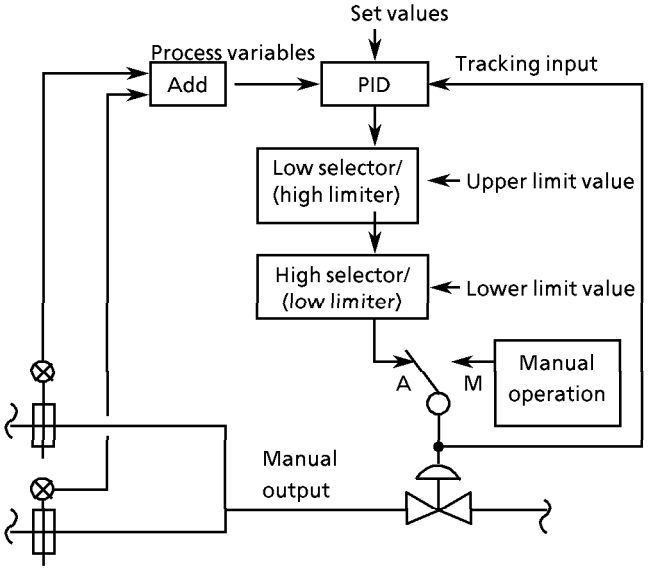
The various computational units are designed with four input lines (H1, H2, P1 and P2) and a single output line. How many of its lines an computational unit uses depends on the computational expression assigned to it. Refer to Chapter 6. COMPUTATIONAL EXPRESSIONS for descriptions of the lines and their individual functions.

The computational units are named according to the computational expression they are assigned. A computational unit assigned the ADD computational expression, for example, is referred to as an [ADD computational unit].

■ Determining computational functions (computational unit data settings)

Configuring the desired computational functions requires deciding on which computational units to assign which functions.

The sample control operation shown below requires the computational unit configuration illustrated on page 5-11. Being able to configure operation in this manner allows a single SDC40B computational unit to perform the processing normally done by systems that combine controllers, computation devices and other auxiliary units.

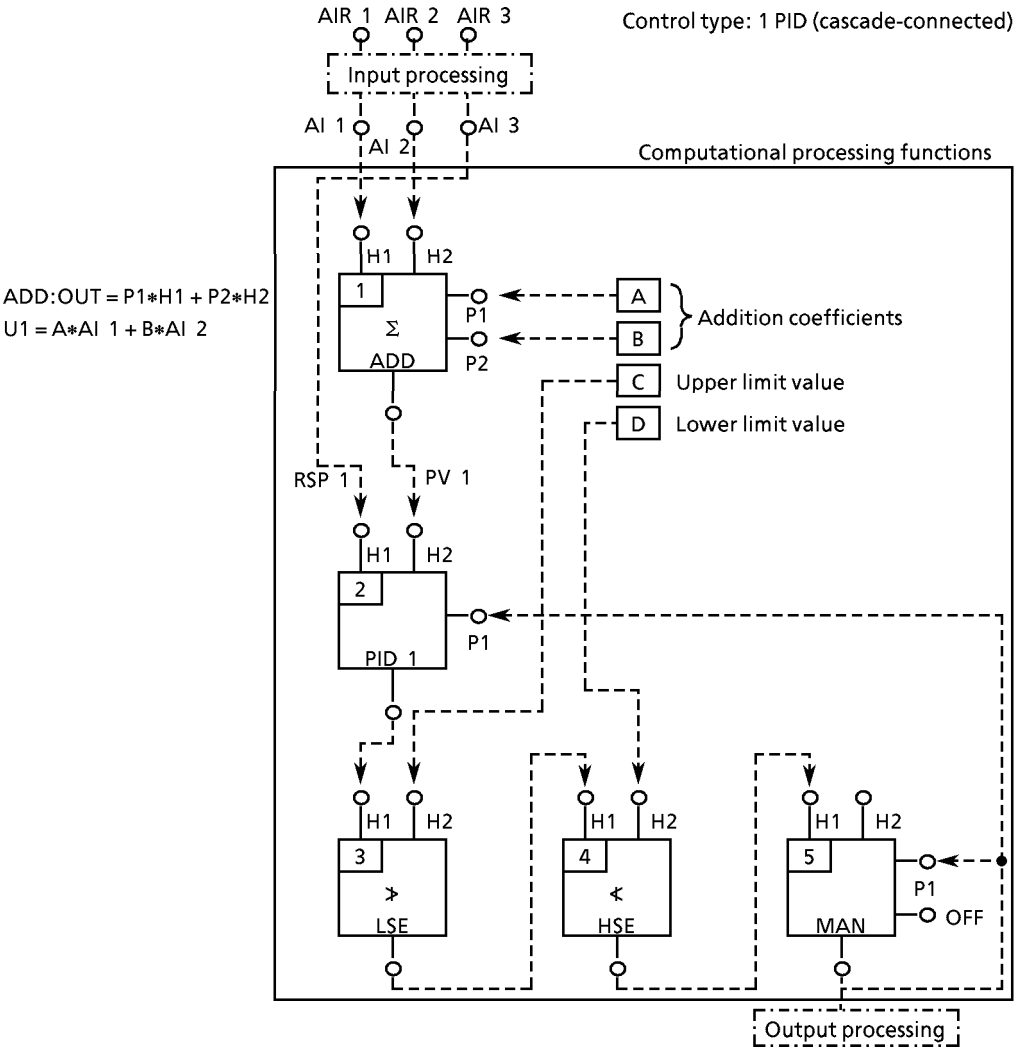


Control operation

The example shows a loop configuration in which PID, based on an external signal, is performed on control variables comprising the sum of two signals.

- Upper and lower limits are applied to automatic control output.
- Manual operation can be performed regardless of these limit values.
- Final stage output, required to enable smooth changeover from manual to automatic operation, is fed back to the PID computational unit.

- Design sheet (computational unit configuration)



The following page shows a sample of a filled-in design sheet. Once computational unit configuration (see figure above) has been determined, the names of computations assigned to each computational unit and the names of input signals connected to individual input lines are entered for each operation unit included in the design sheet's "Computational unit data". The formats for signals connected to individual input lines varies with each computational expression.

Such system constants as the coefficients and limit values, represented by A through D in the figure above, that can be modified during operation are set as "Variable parameters" and "Engineering unit parameters". The following page shows a sample of how variable parameters are filled in.

The SDC40B provides 40 percentage parameters (-999.9 to +999.9%), 10 time parameters (0.0 to 6,000.0s), 20 flag parameters (Off, On), 10 index parameters (0 to 30,000) and 16 engineering unit parameters.

Constants for A to D above, which are set only once and not modified during operation, are referred to as fixed parameters.

There is no restriction on their number and they can be used whenever required. The fixed parameters also come in the 4 percentage (-999.9 to +999.9%), 10 time (0.0 to 6,000.0s), 20 flag (Off, On) and 10 index (0 to 30,000) types, which are selected for input lines according to requirements of the individual computational expression.

- Sample filled-in design sheet

Computational unit No.	Computational expression		H1 input signal name	H2 input signal name	P1 input signal name	P2 input signal name
	Name	No.				
1	ADD	1	AI1	AI2	PPA01	PPA02
2	PID1	19	AI3	UOV01	UOV05	OFF*
3	LSE	11	UOV02	90.0*	—	—
4	HSE	10	UOV03	10.0*	—	—
5	MAN	18	UOV04	0.0*	AO1	OFF*
6						

* Fixed parameters

NOTE

Refer to ■ List of computational expressions (page 6-2 to 6-4) for a detailed description.

- Sample of variable parameters filled-in

Variable parameter name	Value
PPA01	30.0(%)
PPA02	70.0(%)
⌇	
TPA01	300.0(s)
TPA02	6.0(s)
⌇	

The internal signals that can be used as input for the computational units used to configure computational expression functions are shown in the ■ List of internal signals (page 6-5). They possess the percentage, time, flag and index data formats.

As with the variable and fixed parameters, the data formats for internal signals connected to input lines are determined by the type of computation expression. Although the preceding example shows an computational unit assigned an arithmetic computation, the SDC40B also includes logical computations, as well as logic circuits (including relays) normally configured externally, which can be configured using the computational functions.

■ Control computation settings

The SDC40B provides two PID computational expressions, PID1 and PID2. Only one of the available 50 computational units can be assigned to each computation. The computational unit assigned to PID1 becomes controller 1 and the unit assigned to PID2 is controller 2. The two units together are referred to as either the PID computational units or simply the controllers.

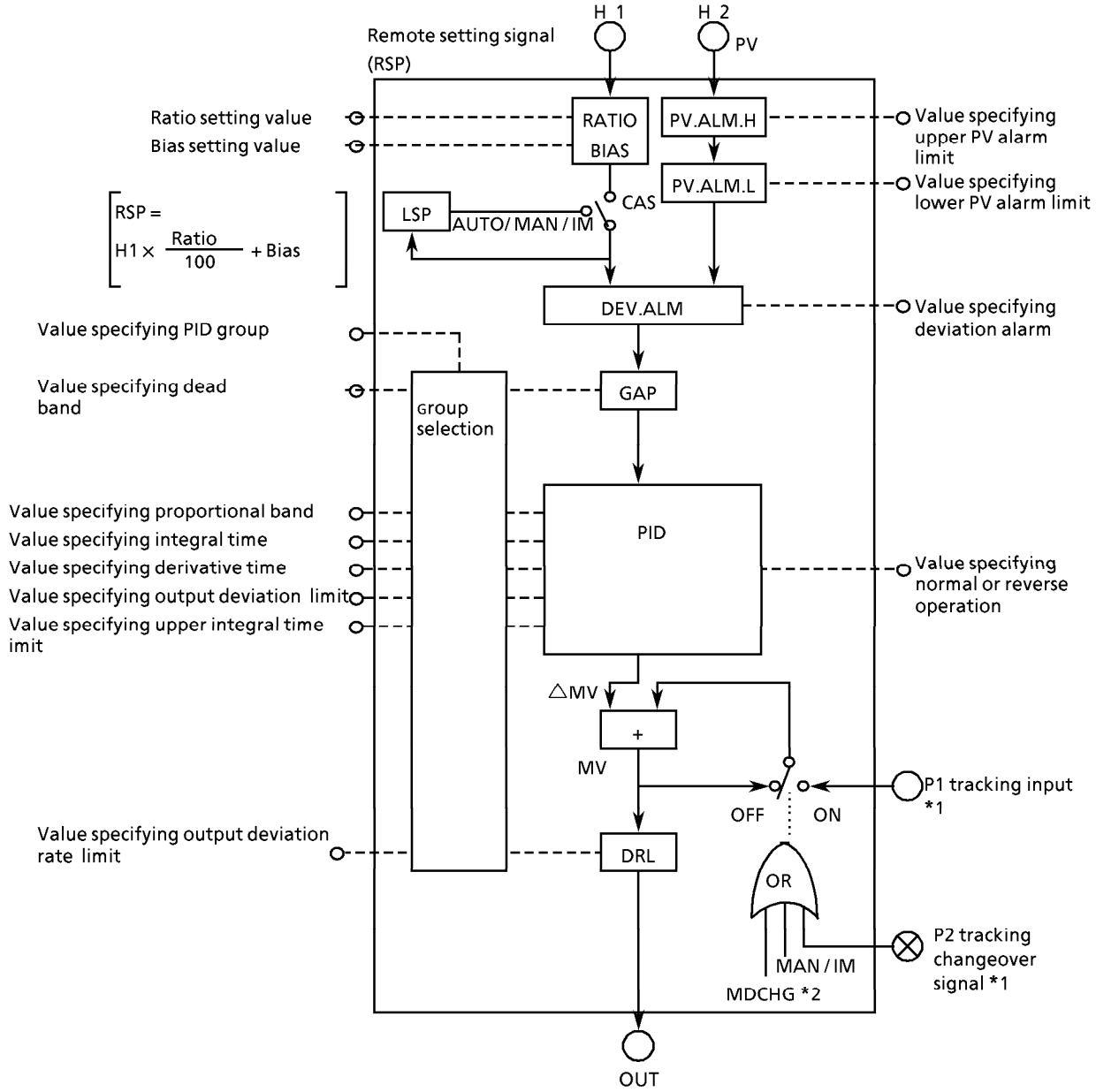
In addition to it's principle control computation, PID computational expressions include such added functions as PV, deviation alarm detection and ratio computations. The PID computation modes, control methods and added functions must be specified using "Control computational data" settings. "PID parameters" must also be used to specify PID control codstants. The following two PID computational modes can be specified using "Control computational data" settings:

· Normal PID (deviation derivative)

· Derivative-based (measured value derivative) PID

- Normal (deviation derivative) control computation mode

  Normal PID performs derivative operations on deviations (SP-PV).
  This type also allows creation of a dead band by setting a deviation level limit below which PID computation is not performed (held).

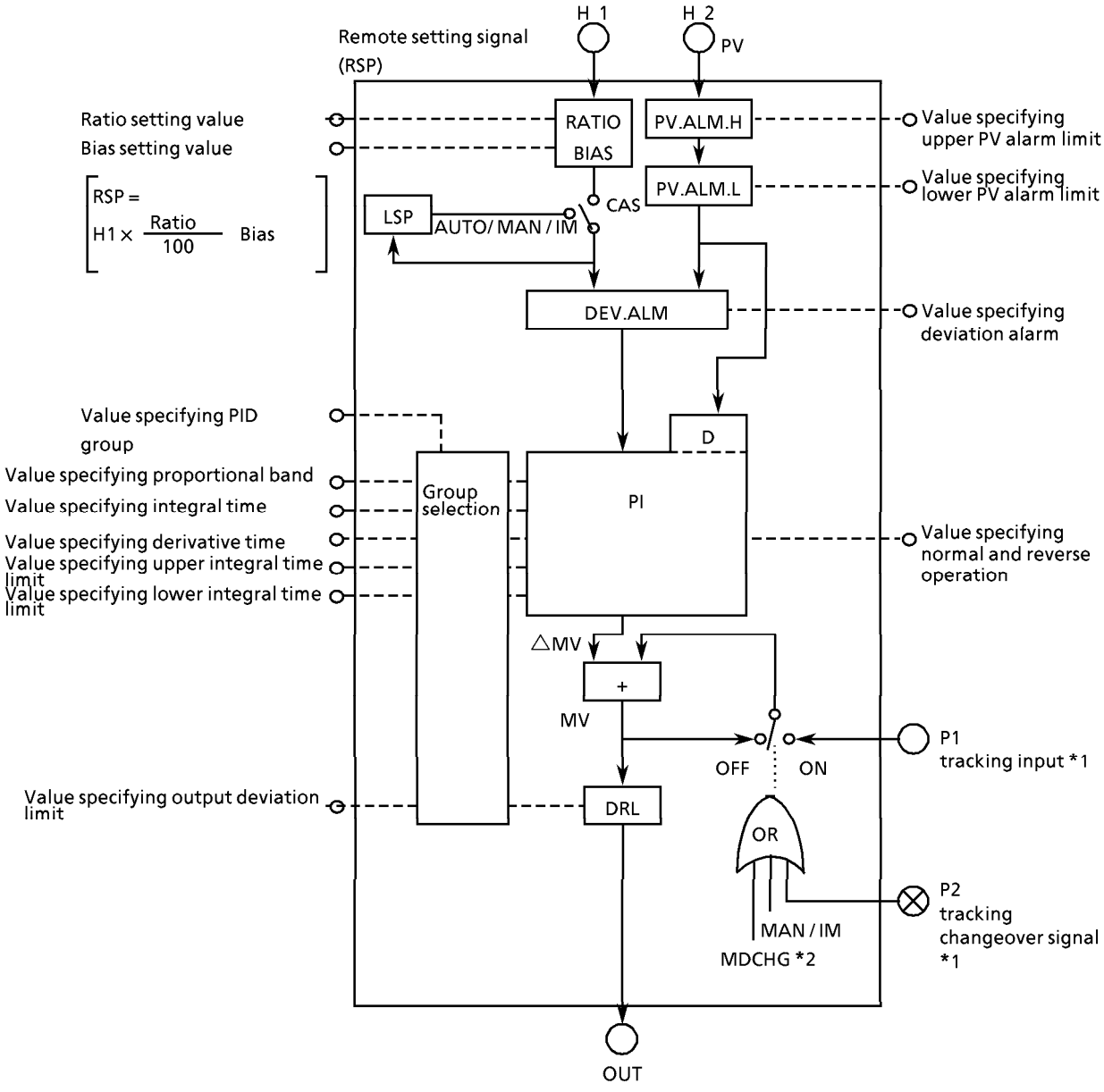


*1 Used for configuring the auto-tracking function.

*2 Mode change(Auto, Manual, Cascade, Follow, Interlock manual)

- Derivative-based (measured value derivative) control computation mode

  As shown in the figure below, derivative-based (measured value derivative) PID performs only derivative operations on measured values (PV). It does not perform derivative operations on set values (SP).
  In addition, the derivative-based PID has no dead band processing capability.



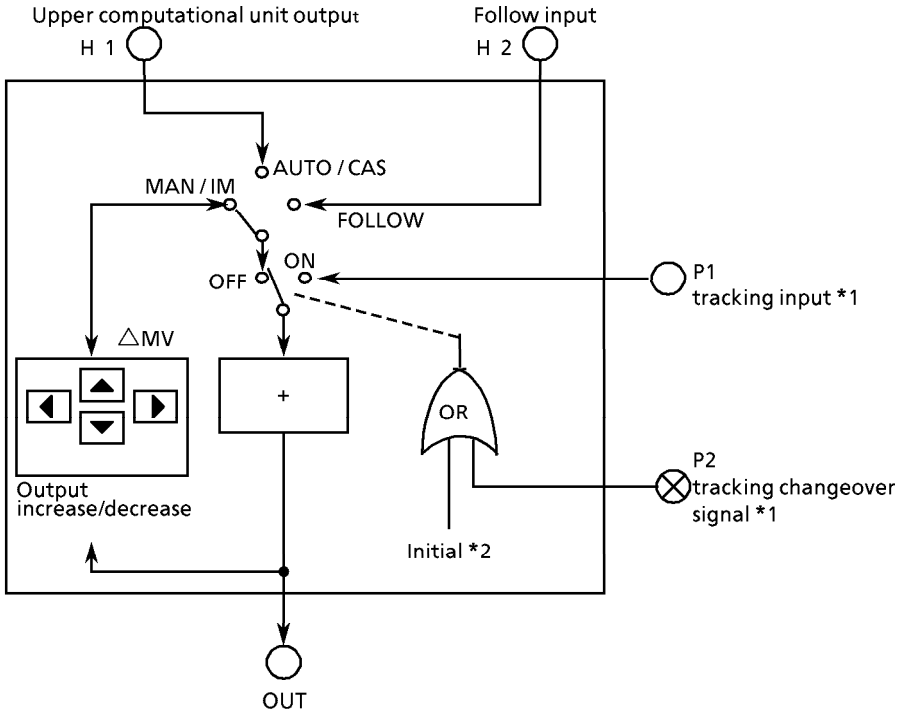
*1 Used for configuring the auto-tracking function.

*2 Mode change(Auto, Manual, Cascade, Follow, Interlock manual)

■ Manual output computation settings

The SDC40B provides a manual output computational expression that enables output to be controlled manually from the system console. This computation is also referred to as MAN, or manual computation.

Only one of the 50 computational units can be assigned to the MAN computation. The figure below shows the configuration of a MAN computational unit.



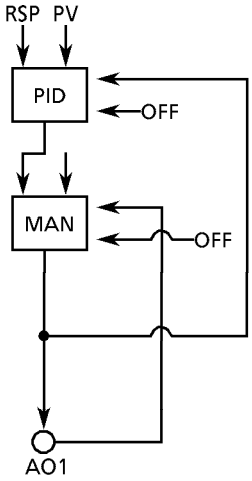
*1 Used for configuring the auto-tracking function.

*2 Power ON

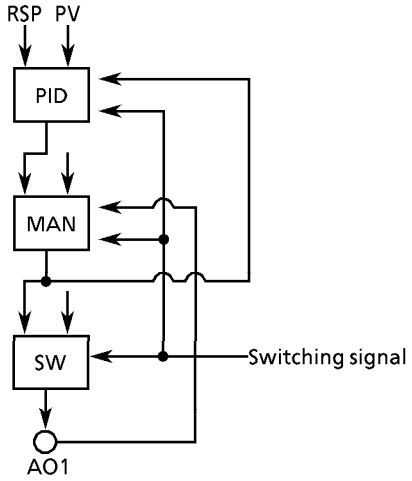
- Examples of MAN computational unit and analog output (AO) connections

  The diagrams below show examples of PID computational unit, MAN computational unit and analog output (AO) connections.

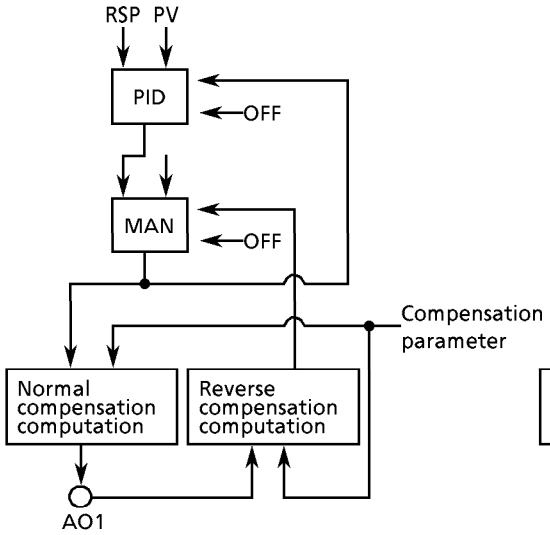
1.MAN computational unit directly connecting AO1



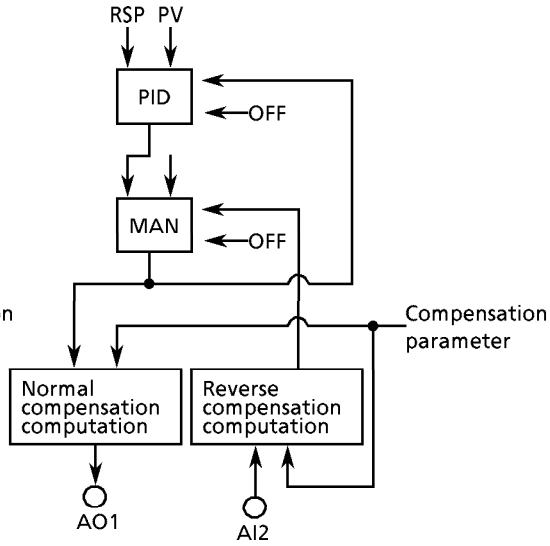
2.MAN computational unit connected to AO1 via switch



3.Computations inserted between MAN computational unit and AO1



4.Computations inserted between MAN computational unit and AO1 (when AI provides output feedback)



With compensation parameters, normally the same values are input for both normal compensation computations and reverse compensation computations.

■ Determining the computation processing cycle

The SDC40B performs computation processing according to fixed cycles. The computation cycle is set by entering the code number (see table below) of the desired cycle length in [setup data]. Note that the processing times (an absolute number) must fall within the allowable processing time (an absolute number) set for every SDC40B processing cycle. Otherwise, actual processing times will exceed computation processing cycles and may result in a computational overload error.

① The total processing time (an absolute number) of all computational units is calculated.Processing times vary according to computational expression; refer to Chapter 6. COMPUTATIONAL EXPRESSIONS for details.

Code	Processing cycle time	Allowable processing time (an absolute number)	
		Without CPL	With CPL
1	0.1s	110	90
2	0.2s	260	220
3	0.3s	410	350
4	0.4s	560	480
5	0.5s	710	610

② The total analog input processing time (an absolute number) specified by the input processing function is calculated according to the table below. If the input is set to not used, temperature compensation, pressure compensation, square-root extraction and linearization table approximation processing times are all set to "0".

	Input processing 1		Input processing 2		Input processing 3	
	No	Yes	No	Yes	No	Yes
Input used	0	18	0	12	0	12
Temperature compensation	0	2	0	2	0	2
Pressure compensation	0	2	0	2	0	2
Square-root extraction	0	3	0	3	0	3
Linearization table approximation	0	6	0	6	0	6

5 - 6 Output Processing Functions

The SDC40B is capable of multiple analog and digital outputs.
Models capable of 5G output (current output) are designed to output three analog signals in the 4 to 20mA range.
Analog output signal 1 (AO1) is referred to as the control output and analog outputs 2 and 3 (AO2 and AO3) as auxiliary outputs.
Models capable of 2G output (position proportional output) are designed to output a set of two types of digital relay outputs used for motor control and one analog signal in the 4 to 20mA range.
Analog output signal 1 (AO1) is referred to as the control output and analog signal 2 (AO2) is not installed. Analog signal 3 (AO3) is referred to as the auxiliary output.
There are three digital relay and five digital open collector output signals.

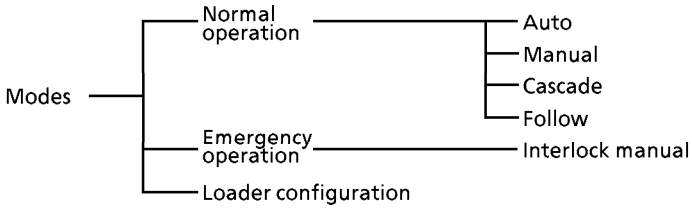
Signal type	Signal name	Description	
		5G control output	2G control output
Analog output signals	AO1	4 to 20mA current output	Position proportional output
	AO2	4 to 20mA current output	Not installed
	AO3	4 to 20mA current output	4 to 20mA current output
Digital output signals	DO1 DO2	Relay output (contact 1a)	Relay output (contact 1a, 1b)
	DO3	Relay output (contact 1a, 1b)	Relay output (contact 1a, 1b)
	DO4 ∫ DO8	Open collector output	Open collector output

The following signals are output when power is turned on (until display and control start) and during the loader configuration mode

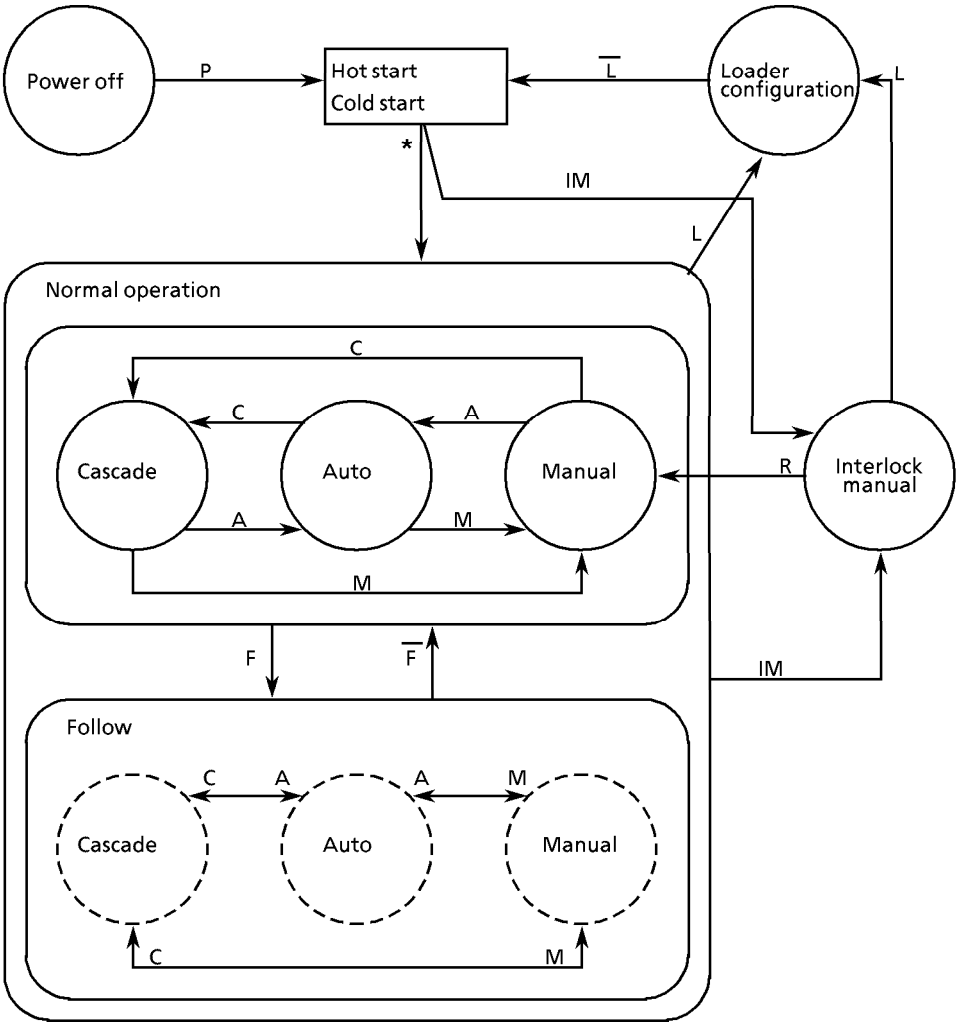
Signal type	Signal name	Output state	
		5G control output	2G control output
Analog output signals	AO1	2.4mA max.	Relay 1 off Relay 2 off
	AO2	2.4mA max.	Not installed
	AO3	2.4mA max.	2.4mA max.
Digital output signals	DO1 ∫ DO8	all off	all off

5 - 7 Modes

The SDC40B possesses the following operating modes:



■ Mode transitions



A : AUTO key or auto mode selection signal
M : MAN key or manual mode selection signal
C : CAS key or cascade mode selection signal
F : follow mode selection signal
$\overline{F}$: follow mode disabling signal
IM : self-diagnostic based failure detection
R : reset signal
L / $\overline{L}$: starts and terminates configurations when loader is connected
P : power ON

* : See Section 7-1 Operating the SDC40B (page 7-1).

■ Normal operating modes

● Auto mode (AUTO)

A "Fixed value control mode", in this mode the PID computational unit performs PID computations using LSP (local SP) values, set by the console's ▲key, ▼key, ▶key and ◀key, as target values.
The console's AUTO LED lights while the auto mode is active.

● Manual mode (MANUAL)

In this mode, the PID computational unit performs only integral operations, the MAN computational unit's output is latched and the console's ▲key, ▼key, ▶key and ◀key can be used to modify output values. The console's MAN LED lights while the manual mode is active.
The manual mode cannot be enabled unless the MAN computational unit has been registered.

● Cascade mode (CASCADE)

A "Cascade control mode", in this mode the PID performs PID computations using the RSP (remote SP) values, input via line H1, as target values.
This mode allows output from other computational units or external signals to be input through the PID computational unit's H1 line and used as remote SP (RSP) values.
The console's CAS LED lights while the cascade mode is active.

● Follow mode (FOLLOW)

In this mode, the MAN computational unit directly outputs the signal (follow signal) input through its H2 line.
In a configuration where an analog signal is input via the MAN computational unit's H2 line, the follow mode can be used to allow the analog signal to alter the MAN computational unit's output.
Enabling the follow mode requires a follow mode changeover signal (external contact signal or internal flag data signal) and the signal to be followed (follow input).
The console's FLW LED lights while the follow mode is active and indicators for the preceding auto, manual and cascade modes remain unchanged. The auto, manual and cascade modes can also be enabled during follow mode operation.

■ Emergency operating modes

The interlock manual mode is available as an emergency operating mode.

● Interlock manual mode

The SDC40B switches to this mode when self-diagnostic functions detect analog input over-range, computational overflow or computational overload during normal operation (in the auto, manual, cascade or follow modes).
Once the SDC40B switches to the interlock manual mode it cannot return to normal operation until one of the following conditions is satisfied.

- Setup's C04 is set to 0.
- Cause is corrected and RST computation resets the system.
- In the case of cold start, power is applied after the cause is removed.

The manual mode is the default mode when normal operation is reenabled.
However, if the MAN computational unit is not registered, the SDC40B defaults to the auto mode.

■ Loader configuration mode

This mode is used to transfer and store configuration data when a loader unit is connected to the SDC40B.

The loader configuration mode is automatically controlled from the loader. Refer to the User's Manual SLPC4B Smart Loader Package CP-UM-1681E for a detailed description.

5 - 8 Control Types

The SDC40B provides the following control types:

Control type	Control type 0	PID1 (local) format
	Control type 1	PID1 (cascade) format
	Control type 2	PID2 (controller 1 for R/L switching) format
	Control type 3	PID2 (controller 2 for R/L switching) format

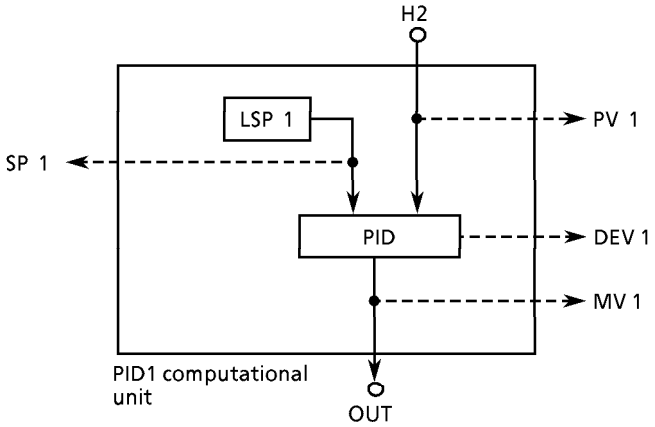
The different types are selected using "Setup data" settings. LSP (local SP/local setting) values refer to the PID computational unit's internal SP values. RSP (remote SP/remote setting) values refer to the PID computational unit's externally input SP values.

■ Control type 0

· PID1 (local) format

Switches between LSP and RSP values to control measuring devices equipped with a single PID computational unit.

(Assigns only one of the 50 computational units to perform PID1 computational expressions.)

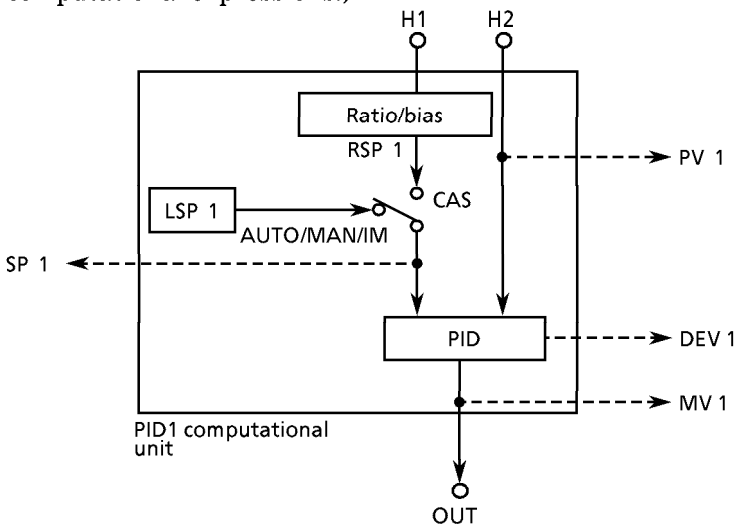


■ Control type 1

· PID1 (cascade) format

Switches between LSP and RSP values to control measuring devices equipped with a single PID computational unit.

(Assigns only one of the 50 computational units to perform PID1 computational expressions.)

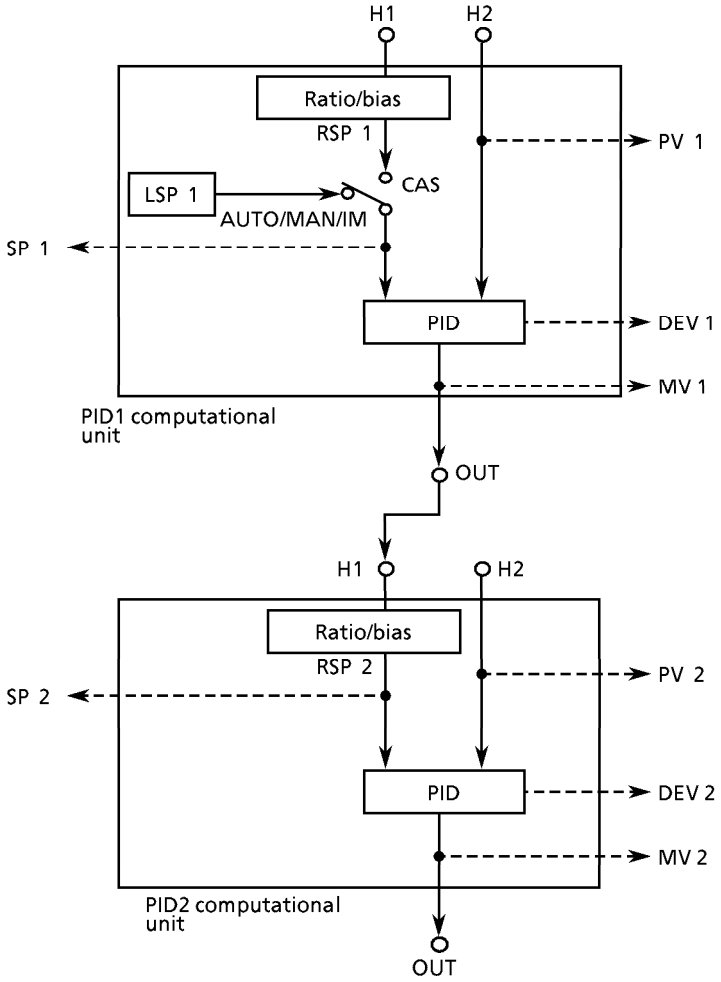


■ Control type 2

· PID2 (controller 1 for R/L switching) format

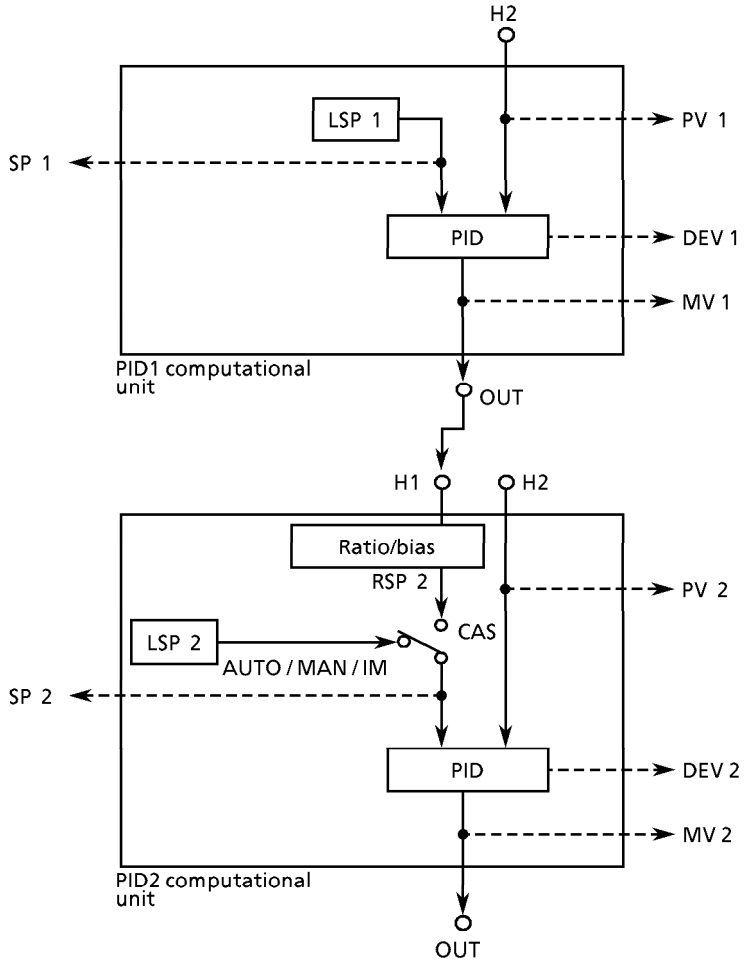
Establishes 2 PID computational units in a single measuring device. Controller 1 of the PID computational units switches between LSP and RSP values to perform control, while controller 2 uses only RSP values to perform control.

(Assigns two of the 50 computational units to perform PID computational expressions.)



■ Control type 3

・ PID2 (controller 2 for R/L switching) format
Establishes 2 PID computational units in a single measuring device. Controller 1 of the PID computational units uses LSP values to perform control, while controller 2 switches between LSP and RSP values to perform control
(Assigns two of the 50 computational units to perform PID computational expressions.)

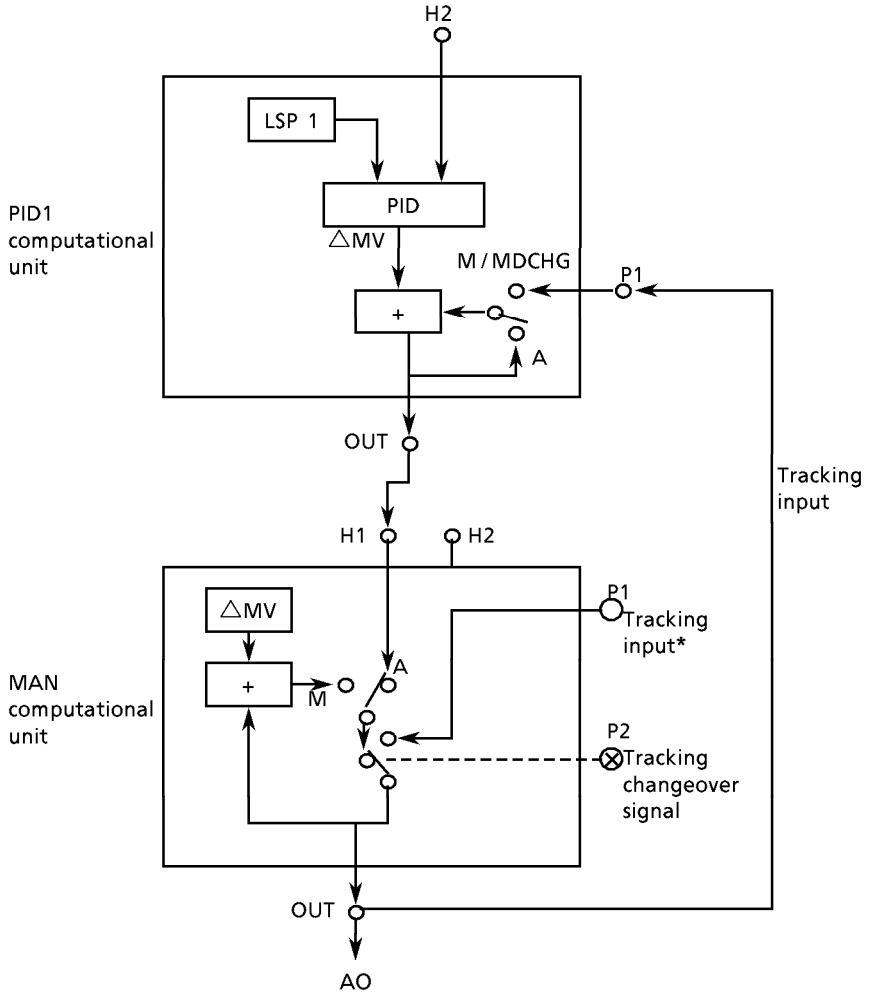


5 - 9 Auto Balance Functions

The SDC40B allows creation of auto balancing functions to prevent output shear that develops with some PID and MAN computational unit feedback input configurations when modes (auto, manual and cascade) are changed.

■ Auto balancing control type 0

As shown in the figure below, connecting the MAN computational unit's output to the PID1 computational unit's P1 (tracking signal input) line balances output in both the auto and manual mode directions.

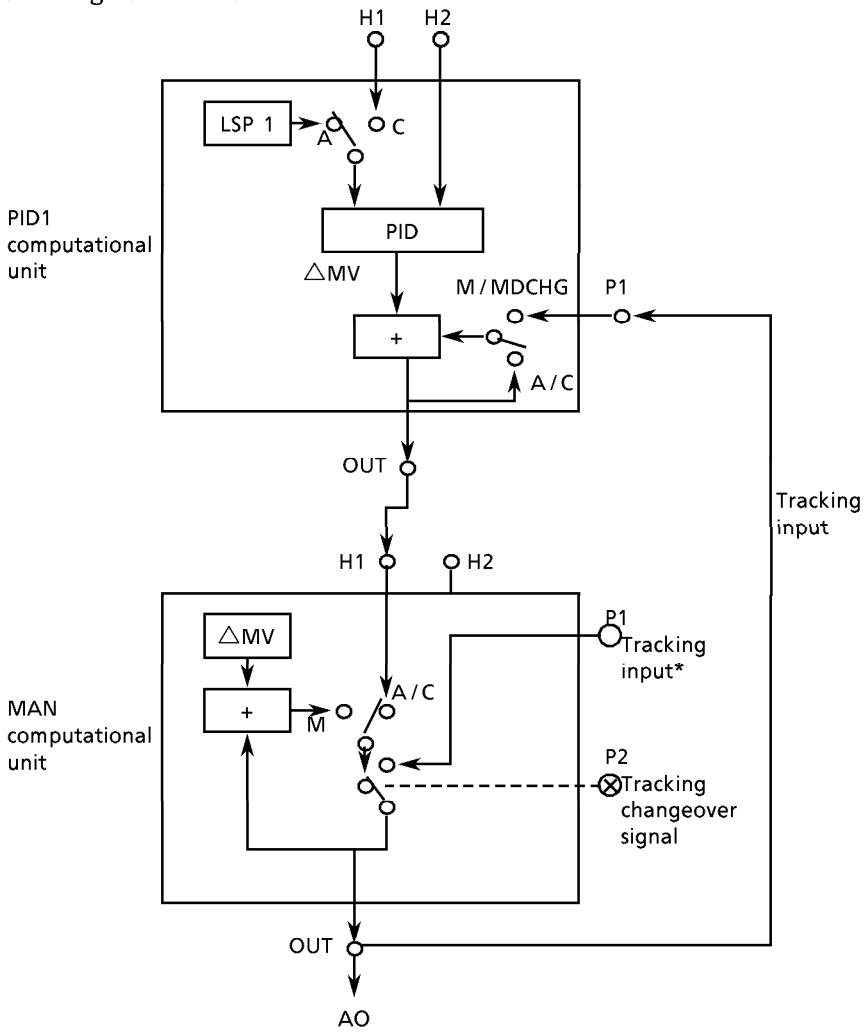


* Refer to page 5-16.

■ Auto balancing control type 1

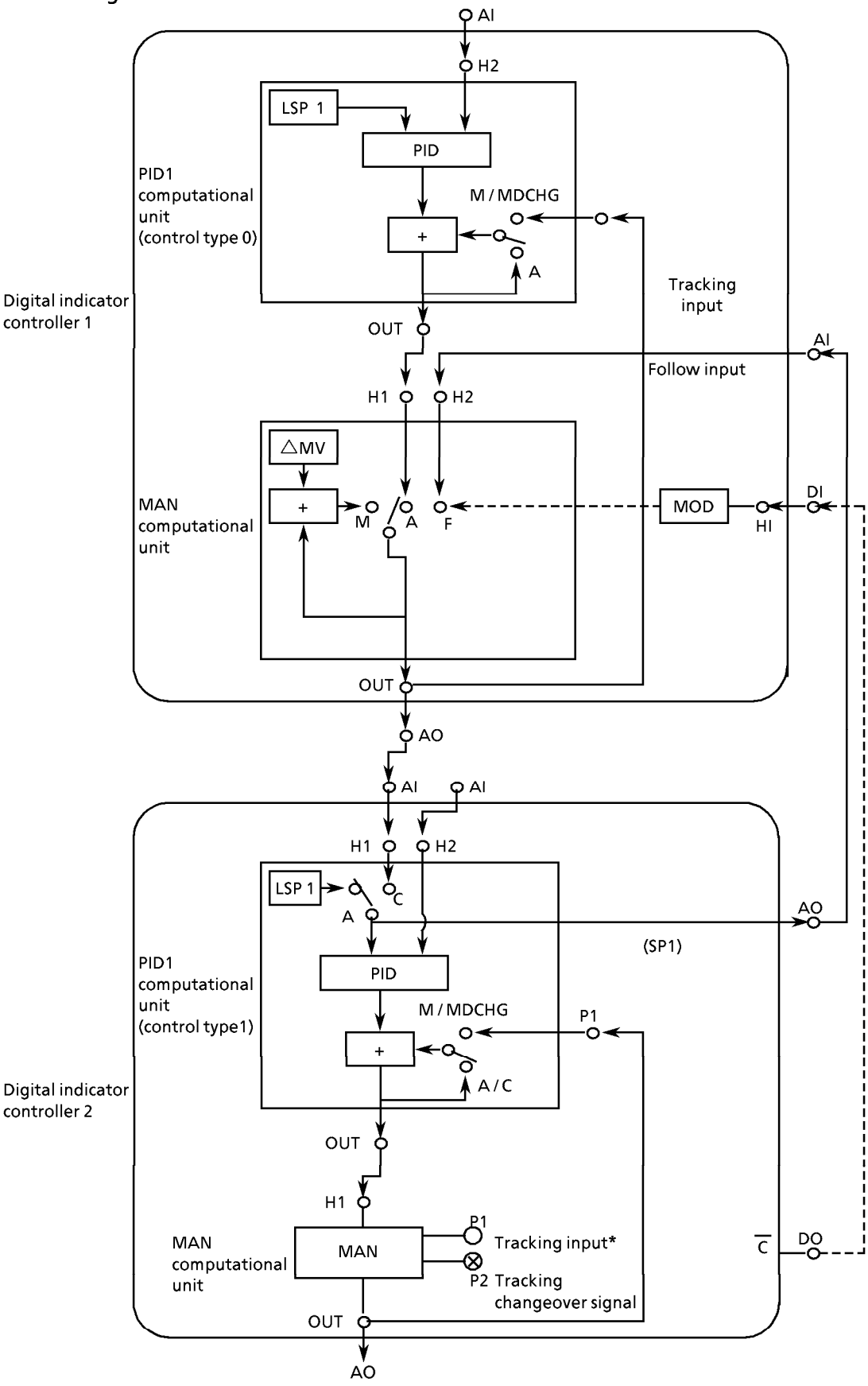
As shown in the figure below, connecting the MAN computational unit's output to the PID1 computational unit's P1 (tracking signal input) line balances output in both the auto and manual mode directions.

The figure on the next page shows an example of an instrumentation arrangement using two SDC40B units, with one unit operating under control type 0 and the other under control type 1. The first unit (operating in auto and manual modes) and second unit (auto, manual and cascade modes) can be operated in any combination of modes without their outputs becoming destabilized.



* Refer to page 5-16.

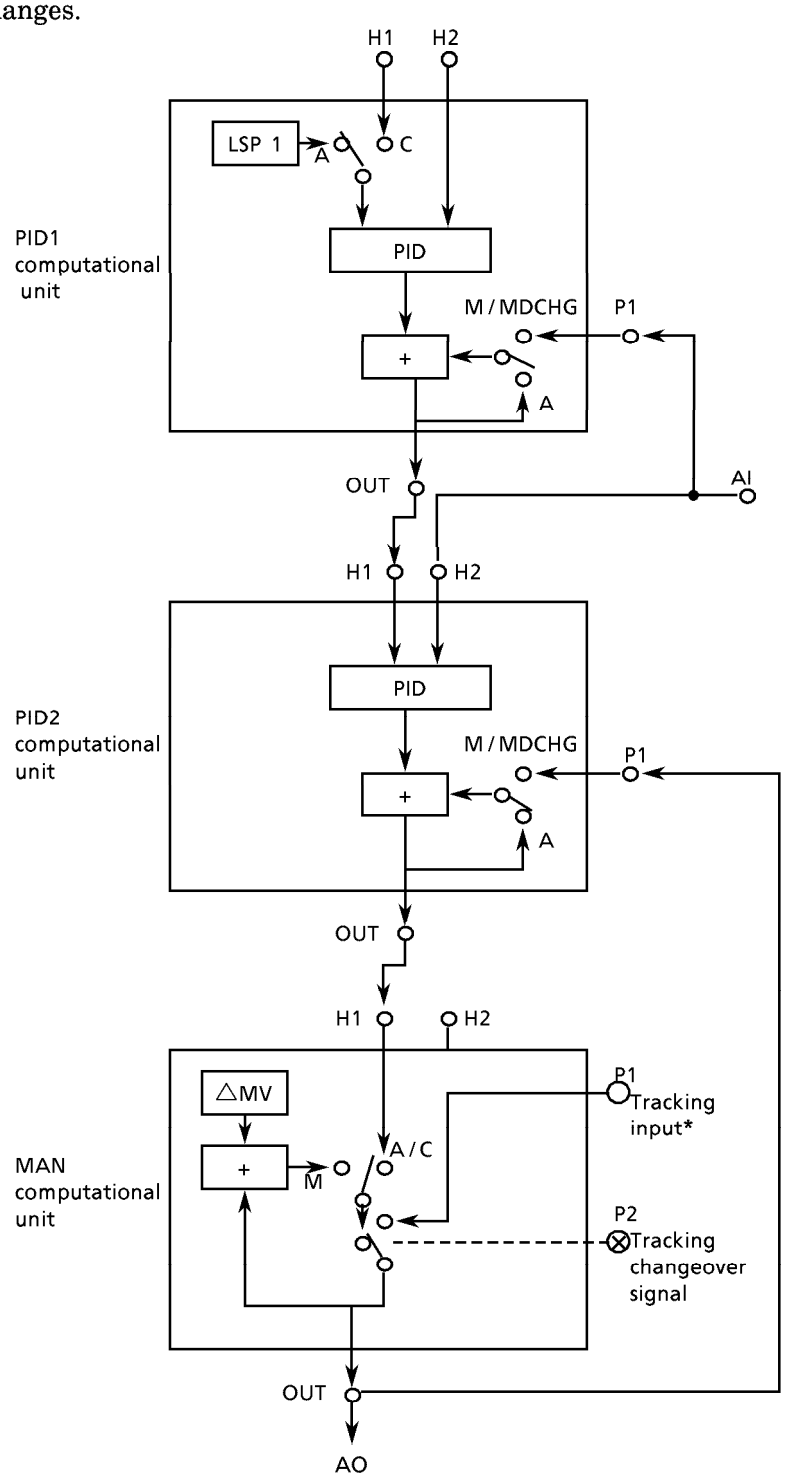
- Auto balancing two controllers



* Refer to page 5-16.

■ Auto balancing control type 2

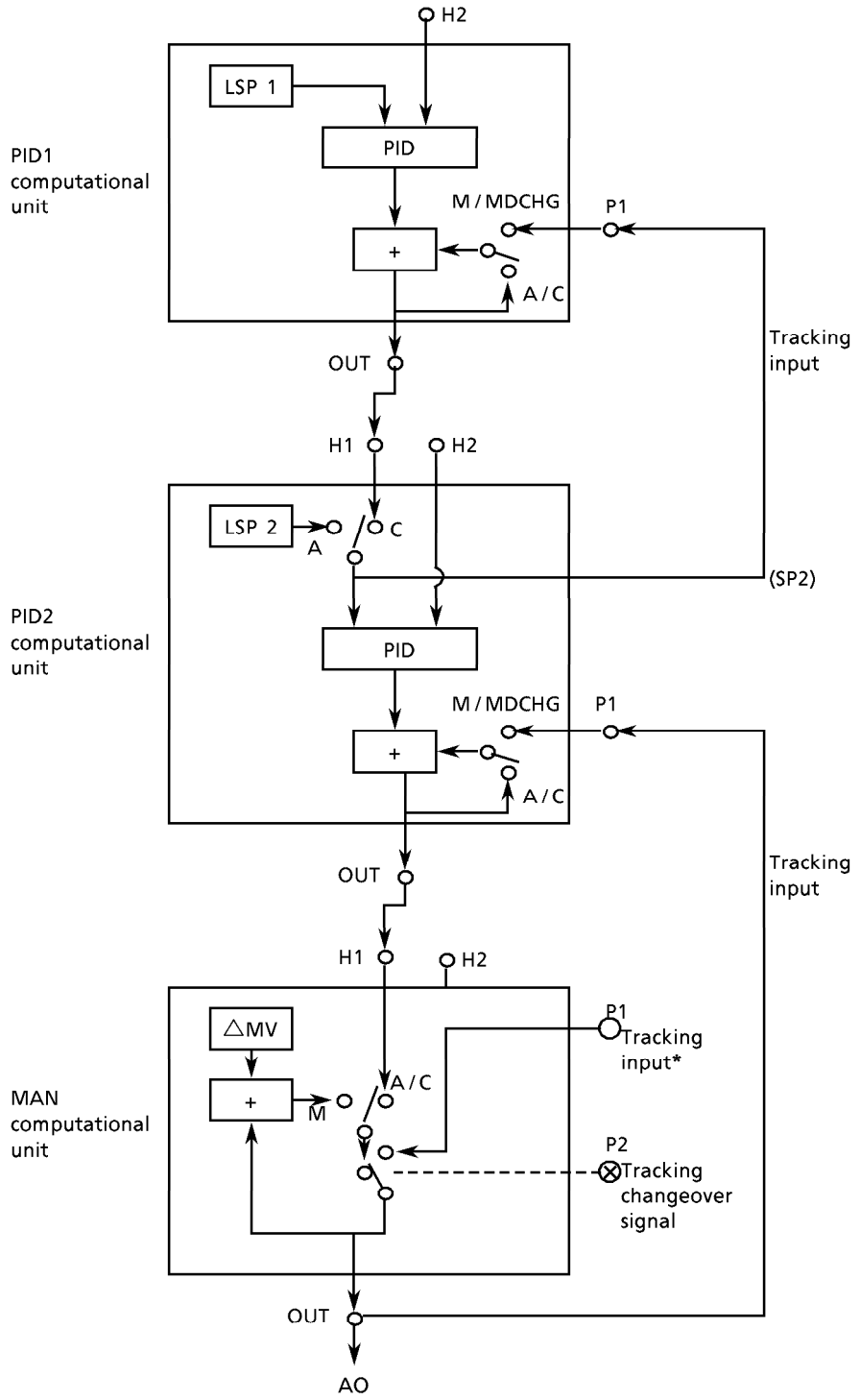
Connecting the various units in the configuration shown in the figure below effectively balances output during mode (auto, manual and cascade) changes.



* Refer to page 5-16.

■ Auto balancing control type 3

Connecting the various units in the configuration shown in the figure below effectively balances output during mode (auto, manual and cascade) changes.



* Refer to page 5-16.

5 - 10 Self-Diagnostic Functions

The SDC40B is equipped with the self-diagnostic functions described below.
Alarm codes are displayed when self diagnostics detects failures and the interlock manual (IM) mode is triggered according to the type of failure.

■ Power ON self-diagnostic routines

- PROM failure (Alarm code : 99)

  This routine is designed to detect errors in system programs stored in the SDC40B PROM. Not totally infallible, there are cases where errors go undetected and result in measuring device operation failure.
  Alarm codes are displayed when errors are detected and, if specified, the SDC40B changes to the IM mode.

- Configuration data failure (Alarm code : 97)

  This routine detects errors in configuration data stored in the EEPROM. Alarm codes are displayed when errors are detected and, if specified, the SDC40B changes to the IM mode.

- Adjustment data failure (Alarm code : 98)

  This routine detects errors in adjustment data stored in the adjustment data EEPROM. Alarm codes are displayed when errors are detected and, if specified, the SDC40B changes to the IM mode.

■ Self-diagnostic routines performed each processing cycle

- Analog input failure (Alarm code : 01 to 09)

  Failures are detected when the analog input signal designated for use as a failure diagnostic signal and set for diagnostics to be performed lies outside the -10.0 to +110.0% range.
  Alarm codes are displayed when errors are detected and, if specified, the SDC40B changes to the IM mode.

- Computational overflow (Alarm code : 82)

  Designed for use with computations with overflow checking functions, this routine detects failures when computation results lie outside the -999.9 to +999.9% range.
  Alarm codes are displayed when errors are detected and, if specified, the SDC40B changes to the IM mode.

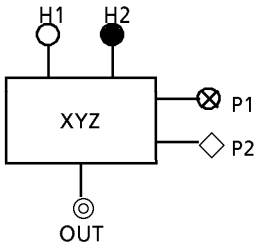
- Computational overload (Alarm code : 83)

  This routine detects failures when all computation processing does not complete within the computation cycle.
  Alarm codes are displayed when errors are detected and, if specified, the SDC40B changes to the IM mode.

Chapter6. COMPUTATIONAL EXPRESSIONS

6 - 1 Computational units

There are a selection of approximately 80 computational expressions that can be used by a maximum of 50 computational units.
Computations are processed according to the computation order registered to the loader for each computation processing cycle.
Refer to the Computational Functions CP-UM-1680E of the SDC40B User's Manuals for detailed descriptions of computational expressions.
The computational units are designed with four input lines (H1, H2, P1 and P2) and a single output line (OUT). Depending on the computational expression assigned to the computational unit, some of the lines may be left unused.
When a computational function is expressed by the function f, its computational unit's input/output configuration is represented by the equation below.
OUT = f(H1, H2, P1, P2)
The active conditions of a computational unit's input/output lines and their data formats are defined by the computational expression registered for use with the unit.
To illustrate this, let's assume that computational expression XYZ is registered for use with the computational unit shown below.



○ H1 line: percent data
The range is -999.9 to +999.9% and data is processed in units of 0.1%.

● H2 line: time data
The range is 0.0 to 6,000.0 sec and data is processed in units of 0.1s.

⊗ P1 line: flag data
The data specifies either Off or On only.

◇ P2 line: index data
The range is 0 to 30,000 and data is processed in units of "1".

◎ OUT line: composite format data
ndicates that data can be in any of the percentage, time, flag or index formats.

- Fixed values can be set for all four input lines (H1, H2, P1 and P2).
- The range for percentage format output is -999.9 to +999.9%. Exceeding this range results in computational overflow.

The following is an example in which the multiplication expression (MUL) is used to apply a 50.0% coefficient to percent data.

Example

The percent data is input to H1 and the 50.0% coefficient to H2.
H2 can be either a fixed value or a variable parameter.
Multiplication (MUL) is used to perform an OUT = H1 × H2 computational expression. The resulting input condition of H1 = 80.0% and H2 = 50.0% is shown in the expression below.

$$OUT = H1 \times H2 = \frac{80.0}{100.0} \times \frac{50.0}{100.0} = \frac{40.0}{100.0} = 40.0\%$$

6 - 2 List of Computational Expressions

■ List of Computational Expressions

No.	Computational expression	Mnemonic	Input				Output	Dynamic area	computational time [absolute No.]	Initial value			
			H1	H2	P1	P2				H1	H2	P1	P2
1	Addition	ADD	○	○	○	○	○	N	3	0.0	0.0	100.0	100.0
2	Subtraction	SUB	○	○	○	○	○	N	3	0.0	0.0	100.0	100.0
3	Multiplication	MUL	○	○	—	—	○	N	2	100.0	100.0	—	—
4	Division	DIV	○	○	○	—	○	N	3	100.0	100.0	0.0	—
5	Absolute value	ABS	○	—	—	—	○	N	1	0.0	—	—	—
6	Square-root extraction	SQR	○	—	○	—	○	N	8	0.0	—	0.0	—
7	Maximum value	MAX	○	○	○	○	○	N	2	0.0	0.0	0.0	0.0
8	Minimum value	MIN	○	○	○	○	○	N	2	100.0	100.0	100.0	100.0
9	4-point addition	SGM	○	○	○	○	○	N	2	0.0	0.0	0.0	0.0
10	High selector/low limiter	HSE	○	○	—	—	○	N	1	0.0	0.0	—	—
11	Low selector/high limiter	LSE	○	○	—	—	○	N	1	100.0	100.0	—	—
12	High/low limiter	HLLM	○	—	○	○	○	N	2	0.0	—	100.0	0.0
13	High monitor	HMS	○	○	—	○	⊗	N	2	100.0	100.0	—	0.0
14	Low monitor	LMS	○	○	—	○	⊗	N	2	0.0	0.0	—	0.0
15	Deviation monitor	DMS	○	○	○	○	⊗	N	3	0.0	0.0	100.0	0.0
16	Deviation rate limiter	DRL	○	○	○	—	○	S	3	0.0	0.0	0.0	—
17	Deviation rate monitor	DRM	○	○	○	○	⊗	L	5	0.0	0.0	0.0	0.0
18	Manual output	MAN*	○	○	○	⊗	○	N	3	0.0	0.0	0.0	OFF
19	Controller 1	PID1*	○	○	○	⊗	○	N	36	0.0	0.0	0.0	OFF
20	Controller 2	PID2*	○	○	○	⊗	○	N	36	0.0	0.0	0.0	OFF
21	Dead time	DED	○	—	●	—	○	L	4	0.0	—	0.0	—
22	Lead/lag	L/L	○	—	●	●	○	S	5	0.0	—	0.0	0.0
23	Derivation	LED	○	—	●	●	○	S	4	0.0	—	0.0	0.0
24	Integration	INT	○	○	●	⊗	○	S	4	0.0	0.0	0.0	OFF
25	Moving average	MAV	○	—	●	—	○	L	11	0.0	—	0.0	—
26	Flip-flop	RS	⊗	⊗	—	—	⊗	N	1	OFF	OFF	—	—
27	Logical product	AND	⊗	⊗	⊗	⊗	⊗	N	1	OFF	OFF	OFF	OFF
28	Logical OR	OR	⊗	⊗	⊗	⊗	⊗	N	1	OFF	OFF	OFF	OFF
29	Exclusive OR	XOR	⊗	⊗	—	—	⊗	N	1	OFF	OFF	—	—
30	Inversion	NOT	⊗	—	—	—	⊗	N	1	OFF	—	—	—
31	2-position transfer switch	SW	○	○	⊗	—	○	N	1	0.0	0.0	OFF	—
32	Softening transfer switch	SFT	○	○	⊗	○	○	S	3	0.0	0.0	OFF	100.0
33	Time format switch	TSW	●	●	⊗	—	●	N	1	0.0	0.0	OFF	—
34	Flag format switch	FSW	⊗	⊗	⊗	—	⊗	N	1	OFF	OFF	OFF	—
35	Alternate switch	ALSW	⊗	—	⊗	—	⊗	S	2	OFF	—	OFF	—
36	Timer	TIM	⊗	—	●	—	⊗	S	2	OFF	—	0.0	—
37	ON delay timer	ONDT	⊗	—	●	—	⊗	S	2	OFF	—	0.0	—
38	OFF delay timer	OFDT	⊗	—	●	—	⊗	S	2	OFF	—	0.0	—
39	One-shot timer	OST	⊗	—	●	—	⊗	S	2	OFF	—	0.0	—
40	Integration pulse output I	CPO	○	—	○	⊗	⊗	S	4	100.0	—	100.0	OFF

Input/ / output ○ : percent data ● : time data ⊗ : flag data

Dynamic area N : unused L : large (up to 8) S : small (up to 20)

* : Can use only one computational expression of the same type.

No.	Computational expression	Mnemonic	Input				Output	Dynamic area	Computational time [absolute No.]	Initial value			
			H1	H2	P1	P2				H1	H2	P1	P2
41	Integration pulse outputII	CPX	○	◇	◇	⊗	⊗	S	4	0.0	1	1	OFF
42	Pulse width modulation	PWM	○	—	●	—	⊗	S	2	0.0	—	0.0	—
43	Ramp signal generation	RMP	⊗	⊗	●	○	○	S	3	OFF	OFF	0.0	100.0
44	Logarithm	LOG	○	—	⊗	—	○	N	8	0.0	—	OFF	—
45	Exponent	EXP	○	—	⊗	—	○	N	18	0.0	—	OFF	—
46													
47													
48													
49													
50													
51	Control variable change 1	PMD1	◎	—	⊗	◇	○	N	2	0.0	—	OFF	I *2
52	Control variable change 2	PMD2	◎	—	⊗	◇	○	N	2	0.0	—	OFF	I *2
53	Mode selection (status detection)	MOD*1	⊗	⊗	⊗	⊗	—	N	2	OFF	OFF	OFF	OFF
54	Mode selection (edge detection)	MODX*1	⊗	⊗	⊗	⊗	—	N	2	OFF	OFF	OFF	OFF
55	Auto-tuning start/stop 1	AT1*1	⊗	—	⊗	◇	—	N	1	OFF	—	OFF	1
56	Auto-tuning start/stop 2	AT2*1	⊗	—	⊗	◇	—	N	1	OFF	—	OFF	1
57	Data hold	HOLD	◎	—	—	◇	◎	N	1	0.0	—	—	1
58	Raise/lower unit	RL	⊗	⊗	○	⊗	○	S	3	OFF	OFF	0.0	OFF
59	Reset unit	RST*1	⊗	—	—	—	—	N	1	OFF	—	—	—
60													
61	Linearization table 1	TBL1	○	—	—	—	○	N	8	0.0	—	—	—
62	Linearization table 2	TBL2	○	—	—	—	○	N	8	0.0	—	—	—
63	Linearization table 3	TBL3	○	—	—	—	○	N	8	0.0	—	—	—
64	Inverse linearization table 1	TBR1	○	—	—	—	○	N	8	0.0	—	—	—
65	Inverse linearization table 2	TBR2	○	—	—	—	○	N	8	0.0	—	—	—
66	Inverse linearization table 3	TBR3	○	—	—	—	○	N	8	0.0	—	—	—
67	Time → % conversion	TTP	●	—	●	●	○	N	2	0.0	—	0.0	0.0
68	% → time conversion	PTT	○	—	●	●	●	N	2	0.0	—	0.0	0.0
69	Engineering unit parameter selection 1	EGP1*1	◇	—	—	—	○	N	1	0	—	—	—
70	Engineering unit parameter selection 2	EGP2*1	◇	—	—	—	○	N	1	0	—	—	—
71													
72													
73													
74													
75													
76													
77													
78													
79													
80													

Input / output ○ : percent data ● : time data ⊗ : flag data
◇ : index data ◎ : composite format data
Dynamic area N : unused L : large (up to 8) S : small (up to 20)

*1 : Can use only one computational expression of the same type.
*2 : A 'P' is displayed on the loader screen.

No.	Computational expression	Mnemonic	Input				Output	Dynamic area	Computational time [absolute No.]	Initial value			
			H1	H2	P1	P2				H1	H2	P1	P2
81	%→%table 1	PTB1	○	—	—	—	○	N	5	0.0	—	—	—
82	%→%table 2	PTB2	○	—	—	—	○	N	5	0.0	—	—	—
83	%→%table 4	PTB3	○	—	—	—	○	N	5	0.0	—	—	—
84	%→%table 4	PTB4	○	—	—	—	○	N	5	0.0	—	—	—
85	%→time table 1	TTB1	○	—	—	—	●	N	5	0.0	—	—	—
86	%→time table 2	TTB2	○	—	—	—	●	N	5	0.0	—	—	—
87	%→time table 3	TTB3	○	—	—	—	●	N	5	0.0	—	—	—
88	%→time table 4	TTB4	○	—	—	—	●	N	5	0.0	—	—	—
89													
90													
91	User lamp output 1	UF1 *	⊗	—	⊗	—	—	N	1	OFF	—	OFF	—
92	User lamp output 2	UF2 *	⊗	—	⊗	—	—	N	1	OFF	—	OFF	—
93	User lamp output 3	UF3 *	⊗	—	⊗	—	—	N	1	OFF	—	OFF	—
94	Bar graph display switch	BLED *	○	—	⊗	◇	—	N	2	0.0	—	OFF	1
95	Additional display unit 1	DSP1 *	○	○	◇	◇	—	N	4	0.0	0.0	0	0
96	Additional display unit 2	DSP2 *	○	○	◇	◇	—	N	4	0.0	0.0	0	0
97	Additional display unit 3	DSP3 *	○	○	◇	◇	—	N	4	0.0	0.0	0	0
98	Additional display unit 4	DSP4 *	○	○	◇	◇	—	N	4	0.0	0.0	0	0
99													

Input / output ○ : percent data ● : time data ⊗ : flag data
◇ : index data ◎ : composite format data
Dynamic area N : unused L : large (up to 8) S : small (up to 20)

* : Can use only one computational expression of the same type.

NOTE

- The asterisk (*) next to names listed in the Mnemonic column of the List of computational expressions table designate computational units capable of using only one computational expression of the same type.
- The SDC40B is equipped with 8 large dynamic areas and 20 small dynamic areas. This means that computational expressions in the table with an L in their Dynamic area column can utilize up to 8 dynamic areas and those with an S can use up to 20.

■ List of internal signals

Signal name	Data format	Description
SP1	○	SP of PID1 computational unit (-10.0 to +110.0%)
PV1	○	PV of PID1 computational unit (-10.0 to +110.0%)
DEV1	○	Deviation (SP1 to PV1) of PID1 computational unit (-12.0 to +120.0%)
PB1	○	Proportional band of PID1 computational unit
RATIO1	○	SP ratio of PID1 computational unit
BIAS1	○	RSP bias of PID1 computational unit
ALMH1	⊗	PV upper limit alarm of PID1 computational unit
ALML1	⊗	PV lower limit alarm of PID1 computational unit
ALMD1	⊗	Deviation alarm of PID1 computational unit
PID1NO	◇	PID group number (0 to 7) of PID1 computational unit
SP2	○	SP of PID2 computational unit (-10.0 to +110.0%)
PV2	○	PV of PID2 computational unit (-10.0 to +110.0%)
DEV2	○	Deviation (SP1 to PV1) of PID computational unit (-12.0 to +120.0%)
PB2	○	Proportional band of PID2 computational unit
RATIO2	○	SP ratio of PID2 computational unit
BIAS2	○	RSP bias of PID2 computational unit
ALMH2	⊗	PV upper limit alarm of PID2 computational unit
ALML2	⊗	PV lower limit alarm of PID2 computational unit
ALMD2	⊗	Deviation alarm of PID2 computational unit
PID2NO	◇	PID group number (0 to 7) of PID2 computational unit
MV	○	MV output of MAN computational unit
AI1	○	Input processed analog input value 1
AI2	○	Input processed analog input value 2
AI3	○	Input processed analog input value 3
AIR1	○	Raw analog input value 1
AIR2	○	Raw analog input value 2 (-10.0 to +110.0%)
AIR3	○	Raw analog input value 3 (-10.0 to +110.0%)
AO1	○	Analog output value 1 (-10.0 to +110.0%)
AO2	○	Analog output value 2 (-10.0 to +110.0%) (Uninstalled and fixed at 0.0% on 2G output models.)
AO3	○	Analog output value 3 (-10.0 to +110.0%)
MFB	○	Motor feedback value (-50.0 to +150.0%) (Uninstalled and fixed at 0.0% on 5G output models.)
IM	⊗	Interlock manual mode
AUT	⊗	Auto mode
MAN	⊗	Manual mode
CAS	⊗	Cascade mode
FLW	⊗	Follow mode
IMCHG	⊗	Changes to interlock manual mode
ACHG	⊗	Changes to auto mode
MCHG	⊗	Changes to manual mode
CCHG	⊗	Changes to cascade mode
FCHG	⊗	Changes to follow mode
MDCHG	⊗	Mode has changed

○ : percent data ● : time data ⊗ : flag data ◇ : index data
◎ : composite format data

Signal name	Data format	Description
RESTRT	⊗	Restart flag (On for 1 cycle at restart)
AT1	⊗	Auto-tuning for PID1 in progress
AT2	⊗	Auto-tuning for PID2 in progress
MFBES	⊗	Assessing motor control position
MFBAT	⊗	Assessing motor control position
DI01~DI12	⊗	Digital inputs 01 to 12
DI01CG~DI12CG	⊗	Changes digital input 01 from Off to On Changes digital input 12 from Off to On
DIX01~DIX06	◇	Digital input computational units 01 to 06
COMERR	⊗	Do not use COMERR, as it is internal signal expansion.
SENS	⊗	Analog input error
COVF	⊗	Computational overflow
OVLD	⊗	Computational time overload
MEMERR	⊗	Memory-related error
UF1KY	⊗	UF1 key input
UF2KY	⊗	UF2 key input
MKY	⊗	MAN key input
AKY	⊗	AUTO key input
CKY	⊗	CAS key input
ATKY	⊗	AT key input
PPA01~PPA40	○	Variable parameters (% format) 01 to 40
TPA01~TPA10	●	Variable parameters (time format) 01 to 10
FPA01~FPA20	⊗	Variable parameters (flag format) 01 to 20
IPA01~IPA10	◇	Variable parameters (index format) 01 to 10
EP1-0~EP2-7	○	Engineering unit parameters 1-0 to 2-7
UOV01~UOV50	◎	Output of computational units 01 to 50

○ : percent data ● : time data ⊗ : flag data ◇ : index data
◎ : composite format data

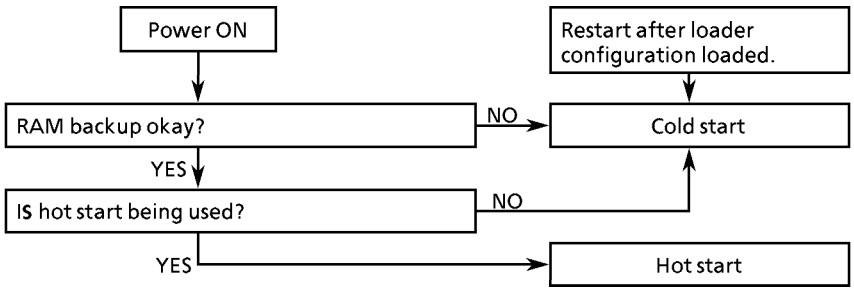
Chapter7. OPERATING THE SDC40B

7 - 1 Power ON

Handling Precautions When starting up a number of SDC40Bs simultaneously, ensure ample power is supplied or stagger their startup times. otherwise, the controllers may not start normally due to inrush current-induced voltage drop.
(voltage must stabilize within 2 seconds after power on.)

The SDC40B is not furnished with a power switch or protective fuses as standard equipment. If required, these must installed externally. The SDC40B's display lights and control operation commences approximately 10 seconds after a 90 to 264 V AC power supply is applied to system connectors 1 and 2. During the period until the systems rise, bar graph LEDs 2 through 10 (starting from left) begin to light successively at unspecified intervals. The SDC40B can be started using either a hot start or a cold start when a direct power supply is used. The desired startup method is specified in "Setup data" settings. The startup methods, flow of startup operation and corresponding modes, LSP values and control output are shown in the figures below.

- Flow of startup operation



- Startup method and corresponding modes, LSP values and control output

Set startup method	RAM backup	Actual startup method	Mode	LSP (local SP)	Control output (AO1)
Hot start	OK	Hot start	Before outage	Before outage	Before outage
	NG	Cold start	Preset mode	Preset value	Preset value
Cold start	Not applicable				

■ Cold start

The modes, control output and preset local SP values for the cold start are specified in "Setup data" settings and are used to commence control operations. Note that the system defaults to the auto mode when the manual mode is specified without the MAN computational unit being registered.

■ Hot start

The hot start is designed to pick up with the mode, control output (AO1) and local SP values in use when a power outage occurred. The SDC40B is only able to hot start, however, during the period the memory RAM data is backed up by the super-capacitor.
When power is restored, the SDC40B checks to see if memory is backed up, then proceeds with hot start if it is and with a cold start if it is not.
It is important to be prepared in event a cold start becomes necessary by specifying the necessary mode, control output (AO1) and preset local SP values in "Setup data" settings.

7 - 2 Changing Normal Display (Display) Items

The "Normal display mode" refers to the items displayed on display panel 1, display panel 2, display panel 3, channel LEDs and the display panel 2 status LEDs.
The normal display mode cycles in order each time the DISP key is pressed.
Other indicators and displays perform their normal display functions, regardless of normal display mode and parameter settings, and are not affected by the pressing of the DISP key.
The items displayed in the normal display mode are divided into the following two categories.

■ Standard normal display mode items

As shown on the following pages, display items are determined by the control types (0 to 3) in effect.

Handling Precautions Display panel 1 and display panel 2 show the following items in the normal display mode when the PID1, PID2 and MAN computational units are not registered:

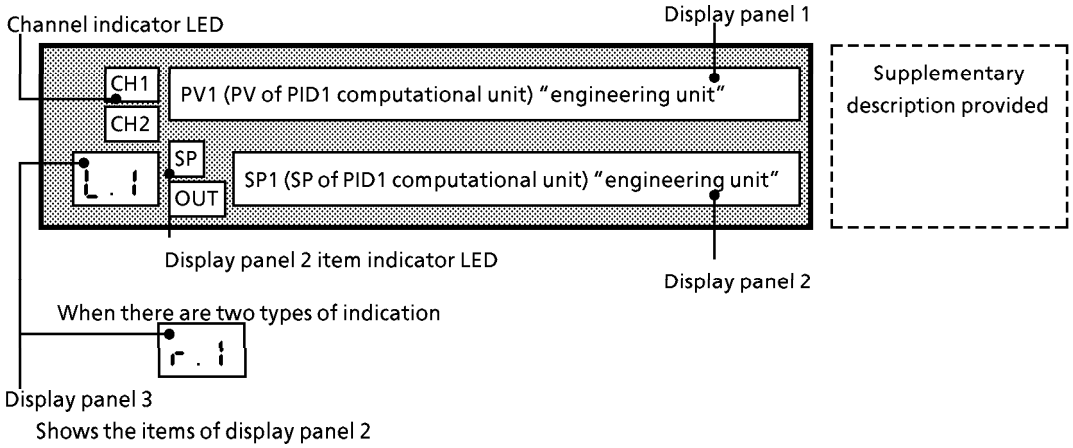
Engineering unit value	Display item
When PID1 computational unit not registered	PV1 displays: ---- SP1 displays: LSP1 values
When PID2 computational unit not registered	PV2 displays: ---- SP2 displays: LSP2 values
When MAN computational unit not registered	MAN computational unit output displays: ----

Engineering units are displayed in the following format:
(Decimals omitted.)

Engineering units	Display item
32767 or over	----
−19999 to 32766	−19999 to 32766
-19999 or under	−19999

■ Additional display unit (1 to 4) items

Using additional display units with computation processing allows the user to configure display items as desired. The display patterns (items) registered with the additional units are displayed in order following the standard display items. To enable differentiation between the additional units 1 to 4, their numbers are shown on display panel 3.
Items corresponding to the lit LED are displayed.

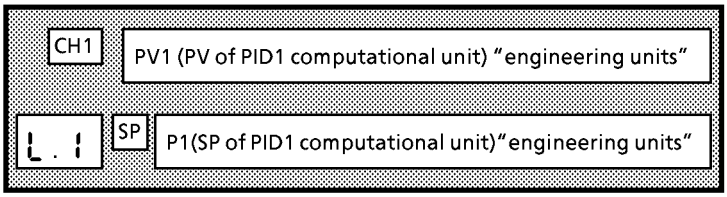


● Standard display items for control type 0

- DISP key formats

Mode	Display Item
Auto	Display 1 → Display 2 → Display 1 (repeats)
Manual	Display 1 → Display 3 → Display 1 (repeats)
Interlock manual	Display 1 → Display 3 → Display 1 (repeats)

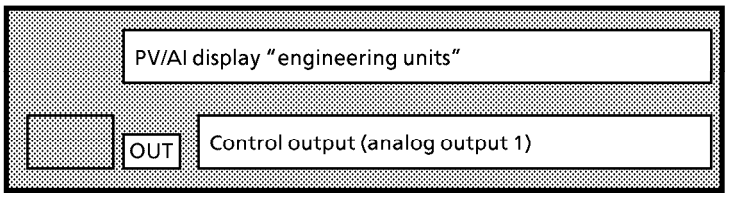
- Display 1



Display panel 2
Always SP1 = LSP1
(Available digits flash when LSP is being changed.)

Display panel 3
Definition of PID1 computational unit's local SP

- Display 2



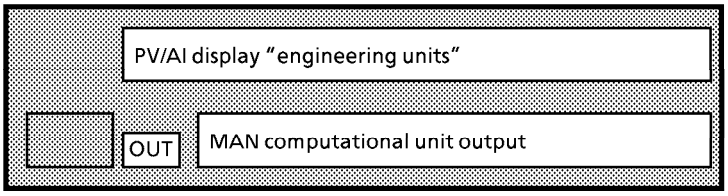
Display panel 1
Specify using setup data settings

Display panel 2
Actual output %

Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights. When it displays PV2, CH2 lights.

- Display 3



Display panel 1
Specify using setup data settings

Display panel 2
Digits available for modification flash

Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights. When it displays PV2, CH2 lights.

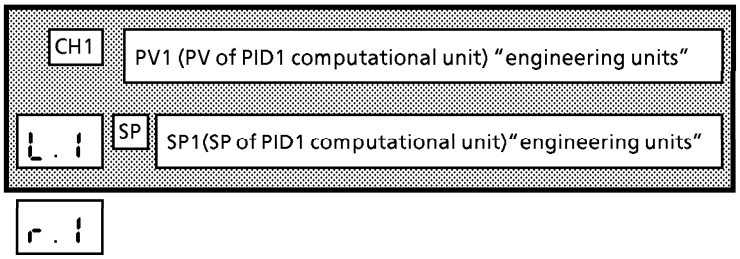
- Displays 1 and 2 are changed by modes. However, when the MAN key is pressed to enable the manual mode, they change to display 3.
- Display 1 appears during both cold starts and hot starts, unless the manual mode is enabled, in which case display 3 appears.

● Standard display items for control type 1

- DISP key functions

Mode	Display Item
Auto	Display 1 → Display 2 → Display 1 (repeats)
Cascade	Display 1 → Display 2 → Display 1 (repeats)
Manual	Display 1 → Display 3 → Display 1 (repeats)
Interlock manual	Display 1 → Display 3 → Display 1 (repeats)

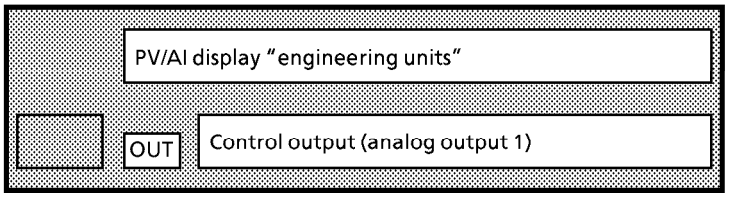
- Display 1



Display panel 2
In auto mode,
SP1 = LSP1
In cascade mode,SP1 = RSP1

Display panel 3
For L . 1
Definition of PID1 computational unit's local SP
For r . 1
Definition of PID1 computational units remote SP

- Display 2



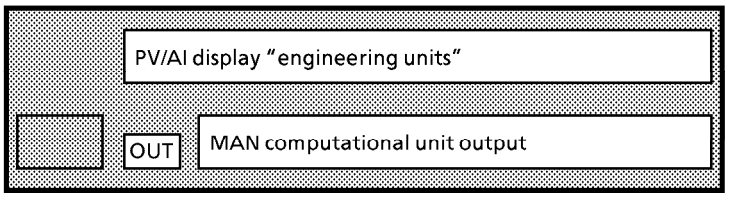
Display panel 1
Specify using setup data setting

Display panel 2
Actual output %

Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights, when it displays PV2, CH2 lights.

- Display 3



Display panel 1
Specify using setup data settings.

Display panel 2
Digits available for modifying flash

Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights, when it displays PV2, CH2 lights.

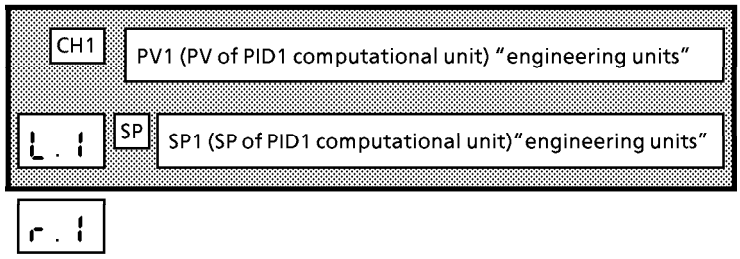
- Displays 1 and 2 are changed by modes. However, when the MAN key is pressed to enable the manual mode, they change to display 3.
- Display 1 appears during both cold starts and hot starts, unless the manual mode is enabled, in which case display 3 appears.

● Standard display items for control type 2

- DISP key functions

Mode	Display Item
Auto	Display 1 → Display 2 → Display 3 → Display 1 (repeats)
Cascade	Display 1 → Display 2 → Display 3 → Display 1 (repeats)
Manual	Display 1 → Display 2 → Display 4 → Display 1 (repeats)
Interlock manual	Display 1 → Display 2 → Display 4 → Display 1 (repeats)

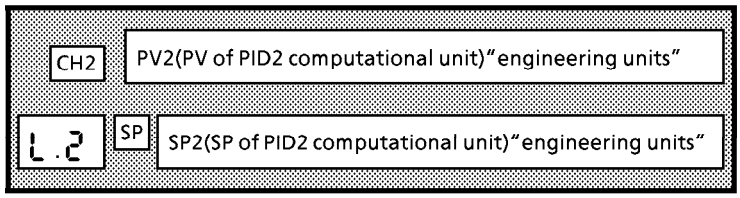
- Display 1



Display panel 2
In auto mode,
SP1 = LSP1In
in cascade mode, SP1 = RSP1
(Available digits flash when LSP is being changed)

Display panel 3
For L.1
Definition of PID1 computational unit's local SP
For r.1
Definition of PID1 computational unit's remote SP

- Display 2

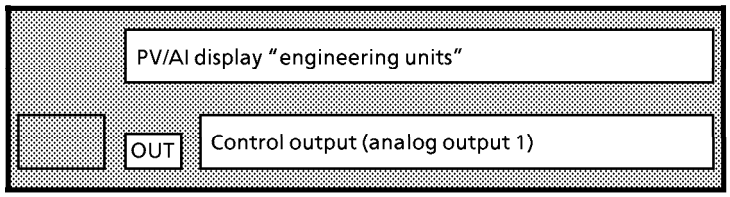


Display panel 1
Specify using setup data settings

Display panel 2
Always SP2 = RSP2

Display panel 3
Definition of PID1 computational unit's remote S

- Display 3



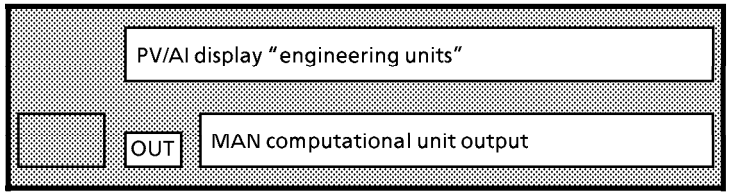
Display panel 1
Specify using setup data settings

Display panel 2
Actual output %

Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights, when it displays PV2, CH2 lights

- Display 4



Display panel 1
Specify using setup data settings

Display panel 2
Digits available for modifying flash

Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights, when it displays PV2, CH2 lights

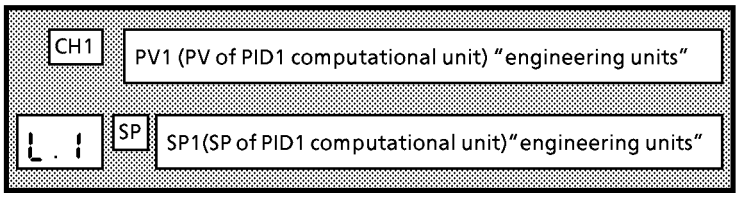
- Displays 3 and 4 are changed by modes. However, when the MAN key is pressed to enable the manual mode, displays 1, 2 and 3 change to display 4.
- Display 1 appears during both cold starts and hot starts, unless the manual mode is enabled, in which case display 4 appears.

Standard display items for control type 3

- DISP key functions

Mode	Display Item
Auto	Display 1 → Display 2 → Display 3 → Display 1 (repeats)
Cascade	Display 1 → Display 2 → Display 3 → Display 1 (repeats)
Manual	Display 1 → Display 2 → Display 4 → Display 1 (repeats)
Interlock manual	Display 1 → Display 2 → Display 4 → Display 1 (repeats)

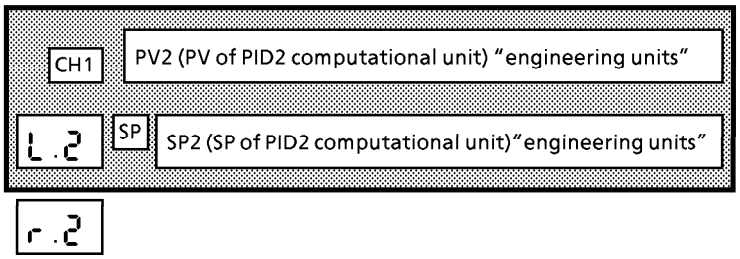
- Display 1



Display panel 2
Always SP1 = LSP1
Available digits flash when LSP is being changed

Display panel 3
Definition of PID1 computational unit's remote SP

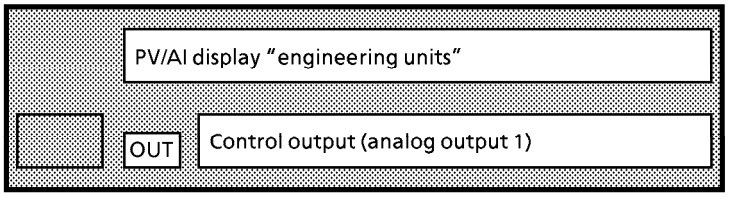
- Display 2



Display panel 2
n auto mode,
SP2 = LSP2
In cascade mode,SP2 = RSP2

Display panel 3
For L.2
Definition of PID2 computational unit's local SP
For r.2
Definition of PID2 computational unit's remote SP

- Display 3



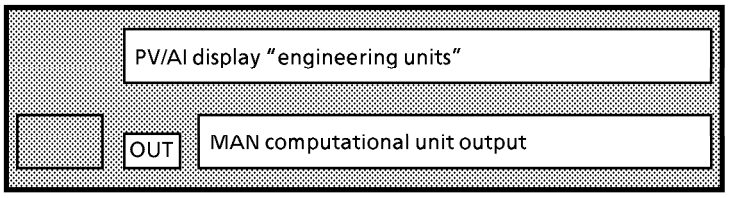
Display panel 1
Specify using setup data settings

Display panel 2
Actual output %

Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights, when it displays PV2, CH2 lights

- Display 4



Display panel 1
Specify using setup data settings

Display panel 2
Digits available for modifying flash

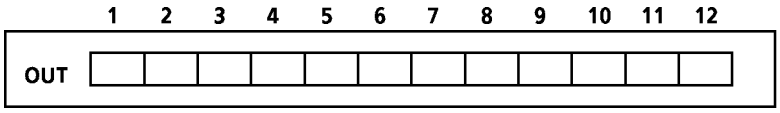
Display panel 3
Goes off

Channels 1 and 2 light
When display panel 1 displays PV1, CH1 lights; when it displays PV2, CH2 light

- Displays 3 and 4 are changed by modes. However, when the MAN key is pressed to enable the manual mode, displays 1, 2 and 3 change to display 4.
- Display 1 appears during both cold starts and hot starts, unless the manual mode is enabled, in which case display 4 appears.

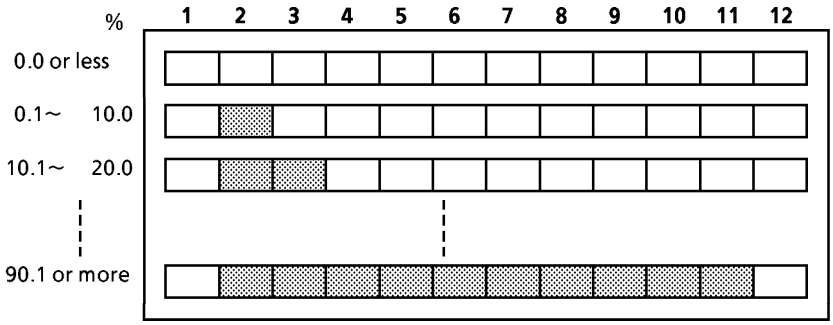
7 - 3 Bar Graph Display

The bar graph display is composed of a series of 12 LEDs.
Although normally designed to serve as a control output monitor, the bar graph display can also be used as analog (percent data) or digital (DI, DO) monitor by registering bar graph display computations for computational units.
During the period the system rises after power is applied, LEDs 2 through 10 display system startup conditions successively at unspecified intervals. Bar graph LEDs 2 through 11 also light successively to indicate transfer progress status during the loader configuration mode.



■ As an analog monitor

As shown in the figure below, when serving as an analog monitor, each lit LED indicates a unit of 10%.
When operating in its default mode (bar graph display computation not specified), the bar graph display functions as control output monitor and the OUT sign lights.
The OUT sign goes off when a bar graph display computation is in effect.



■ As a digital monitor

When a bar graph display computation is used with digital input (DI), the DI ON signal turns on the 12 LEDs corresponding to DI1 to DI12 and DI OFF turns them off. When a bar graph display computation is used with digital output (DO), the DO ON signal turns on the LEDs corresponding to DO1 to DO8 and DO OFF turns them off. LEDs 9 to 12 stay off during output display.
The OUT sign remains off while the bar graph display is used for digital input (DI) and output (DO).

7 - 4 System Operating Procedures

The SDC40B allows changing of modes using the AUTO, MAN and CAS keys when mode changing operations are not in use. The SDC40B must be in the normal display mode for the mode changing keys to have effect.

The normal display mode can be enabled by pressing the DISP key.

The console's AUTO, MAN, and CAS keys are ineffective when mode changing operations are in use.

In order to be able to changes modes using console keys, as well, while mode changing operations are in use, connect internal key input signals to mode changing operations using design data settings.

The functions of individual keys vary according to control type, as shown in the table below.

Control type	Key functions		
	AUTO key	MAN key	CAS key
0	Changes MAN computational to auto mode.	Changes MAN computational to manual mode.	Invalid
1	Changes PID1 computational to auto mode. Changes MAN unit to combined auto and cascade modes.	Changes MAN computational to manual mode.	Changes PID1 computational to cascade mode. Changes MAN unit to combined auto and cascade mode
2	Changes PID1 computational to auto mode. Changes MAN unit to combined auto and cascade modes	Changes MAN computational to manual mode.	Changes PID1 computational to cascade mode. Changes MAN unit to combined auto and cascade mode
3	Changes PID2 computational to auto mode. Changes MAN computational to combined auto and cascade modes.	Changes MAN computational to manual mode.	Changes PID1 computational to cascade mode. Changes MAN computational to combined auto and cascade mode

7 - 5 LSP Settings

The SDC40B utilizes an LSP modification setup that allows the user to modify LSP settings while LSP values are displayed on the normal display mode's display panel 2.

● Conditions for modifying LSP values

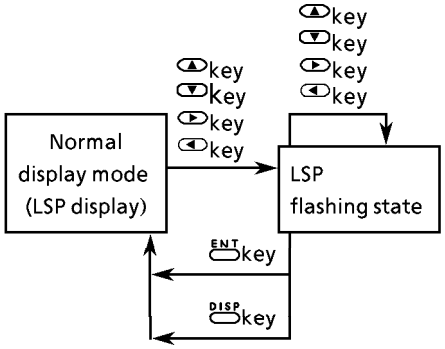
- The "LSP1 setting method" and "LSP2 setting method" must not be set to "modify-prevent."
  When set to modify-prevent, the LCK LED lights while LSP values are displayed on display panel 2.

● Standard displays during which LSP settings can be made

These vary according to control type.

Control type 0: LSP1 can be modified during standard display 1.
Control type 1: LSP1 can be modified during standard display 1 of the auto mode.
Control type 2: LSP1 can be modified during standard display 1 of the auto mode.
Control type 3: LSP1 can be modified during standard display 1.
LSP2 can be modified during standard display 2 of the auto mode.

● Procedure



1. Press the ▲key, ▼key, ▶key and ◀key while in the modification enabled state.
   ▸ The LSP setting begins to flash.
   This is referred to as the registration state.
2. Press the ▲key, ▼key, ▶key and ◀key to select the desired values.
3. Press the ENT key.
   ▸The numbers stop flashing and the new values are stored in the LSP memory.
4. To terminate LSP modification, press the DISP key.

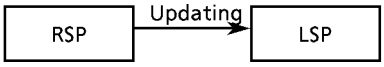
Handling Precautions When "direct change enabled" is specified for the LSP1 and LSP2 setting methods, new values can be stored in the LSP memory (RAM) without having to press the ENT key in the registration state.
Simply pressing the DISP key to terminate modification stores all changed values in the memory (RAM).

● LSP updating

● Cascade mode

· The LSP in cascade mode is always updated by the RSP value.

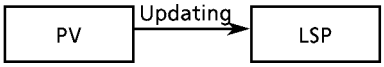
· In cascade mode, the LSP cannot be changed by key operation nor communication method.



● Manual mode / Interlock manual mode

· When the "PV tracking used" is selected in the control computational data settings, the LSP in manual mode is always updated by the PV value.

· When the "PV tracking used" is selected in manual mode, the LSP cannot be changed by key operation nor communication method.



● Auto mode

· When the cascade mode is changed to the auto mode, the LSP is rewritten to the RSP just prior to the transition.

· When the manual mode is changed to the auto mode with setting of "PV tracking used", the LSP is rewritten to the PV just prior to the transition.

Control computational data	Auto mode	Manual mode	Cascade mode
PV tracking not used	LSP not updated	LSP not updated	Updated at LSP = RSP
PV tracking used	LSP not updated	Updated at LSP = PV	Updated at LSP = RSP

7 - 6 Manual Output Settings

Manual output can be modified when the SDC40B is in the normal display mode with either the manual or interlock manual operating modes enabled and MAN unit output flashing on display panel 2.

When not in the normal display mode and MAN computational unit output is not shown on display panel 2, press the DISP key to enable the manual output modification state.

Handling Precautions

- When the MAN computational unit is not registered, display panel 2 displays "----" and manual output modification procedures are rendered ineffective.
- When in the follow or manual modes, output setting procedures connot be performed.

● Procedure

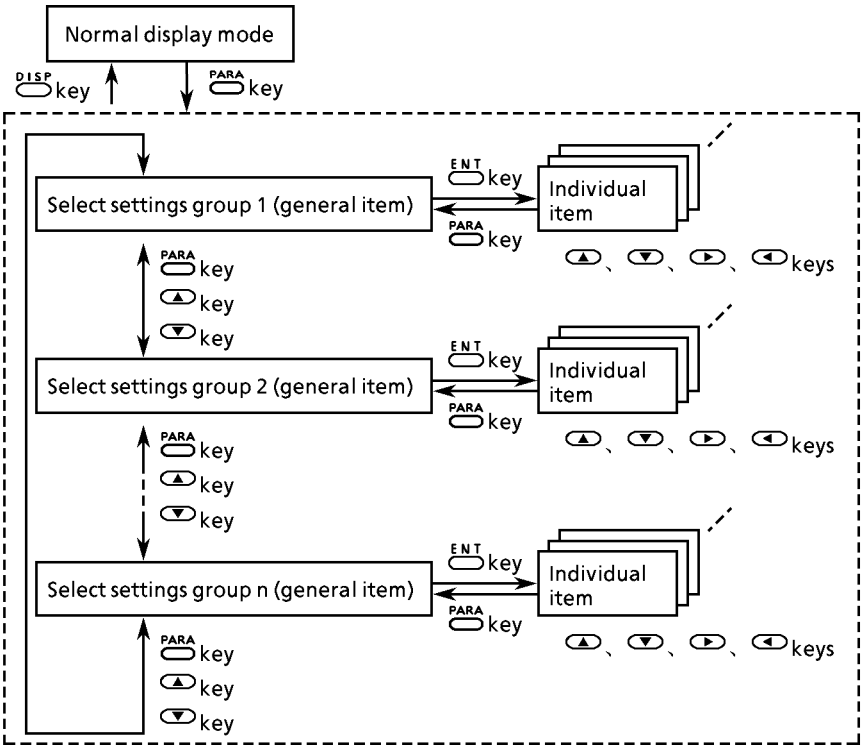
Modify output by pressing the ▲ key, ▼ key, ▶ key and ◀ key.
Pressing the ENT key is not required.

7 - 7 Control Data Settings

When the SDC40B is in the normal display mode, control data settings can be modified from all modes; that is, the auto, manual cascade, follow and interlock manual modes.
Monitor data can also be viewed using the same procedures.
The normal display mode can be enabled by pressing the DISP key.

■ Selecting control data settings groups

Control data setting is divided into the two phases of selecting settings group (general item) and individual item (specific item).
Pressing the PARA key in the normal display mode enables selection of settings group (general item) by displaying settings group on display panel 1. At this time, display panels 2 and 3 are off.
Pressing the PARA key, ▲ key and ▼ key cycles through display of settings groups.



This procedure does not display all settings groups. It only displays the settings groups specified using the SEL (transition selection) item in "protect". The relationship between settings groups and SEL values is shown on the following page.
Pressing the ENT key when the desired settings group is displayed changes operation to the individual item (specific item) selecting stage.

Settings group	Display panel 1	SEL setting values					
		0	1	2	3	4	5
Setup data	SEtUP	–	–	–	○	–	○
Input processing data	In	–	–	–	○	–	○
Control computational data	contL	–	○	–	–	–	○
PID parameters	PId	–	○	–	–	–	○
Linearization table data	tbL	–	–	○	–	–	○
PTB table data	Ptb	–	–	○	–	–	○
TTB table data	ttb	–	–	○	–	–	○
Variable parameters (percentage format)	P.PArA	–	○	–	–	–	○
Variable parameters (time format)	t.PArA	–	○	–	–	–	○
Variable parameters (flag format)	F.PArA	–	○	–	–	–	○
Variable parameters (index format)	I.PArA	–	○	–	–	–	○
Engineering unit parameters	E.PArA	–	○	–	–	–	○
UF key processing data	UF	–	–	–	○	–	○
Digital input processing data	dI.Fnc	–	–	–	○	–	○
ID data	Id	–	–	–	○	–	○
Computational unit monitor	Unit	–	–	–	–	○	○
Input/output signal monitor	Io.dAt	–	–	–	–	○	○
Protect	Prtct	○	○	○	○	○	○

* The ○ indicates settings groups that are displayed, the – indicates those that are not.

■ Progression of individual items in control data settings

The item codes for individual (specific) items are shown on display panel 1 and their setting values are shown on display panel 2.

Display panel 3 is also used to supplement item code display when required. Individual items are displayed in the vertical-horizontal matrix shown on the following page, with matrix sizes varying according to settings group. The ◁key, ▽key, ▷key and △key are used to cycle through individual items.

■ Modifying individual items and exiting the setting mode

Pressing the ENTkey while an individual item is displayed starts its set values flashing and enables the "registration state." At this point, the △ key and ▽key increase and decrease the values, while the ▷key and ◁ key move the digit positions on the display at which the values flash.

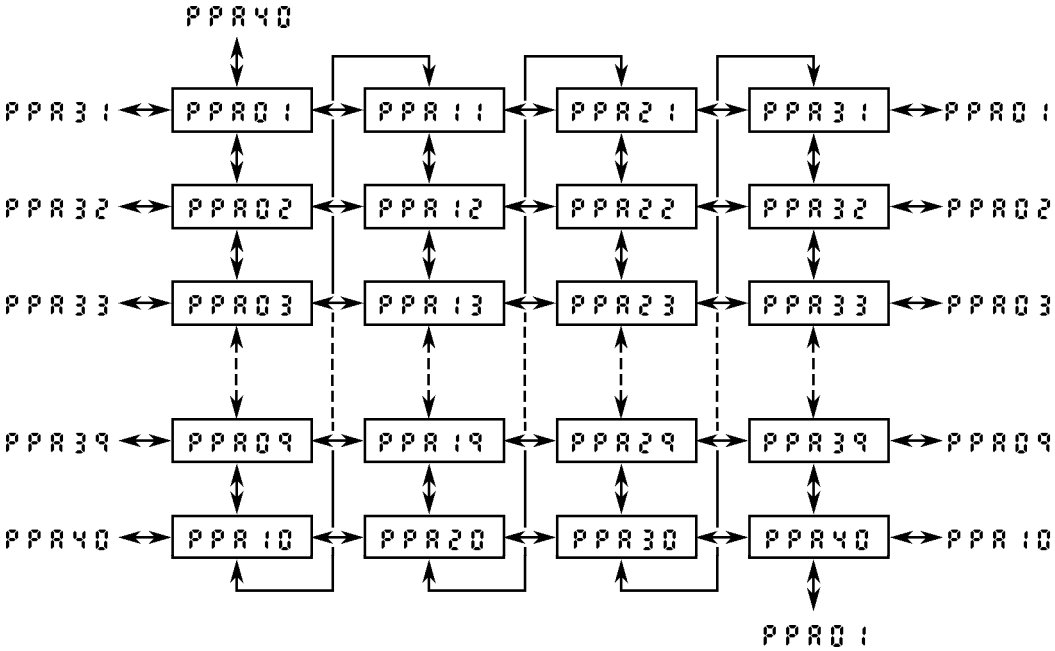
Pressing the ENTkey after the flashing number has been changed to the desired value stops the flashing, the number reverts to the on state and the new setting is stored in internal memory.

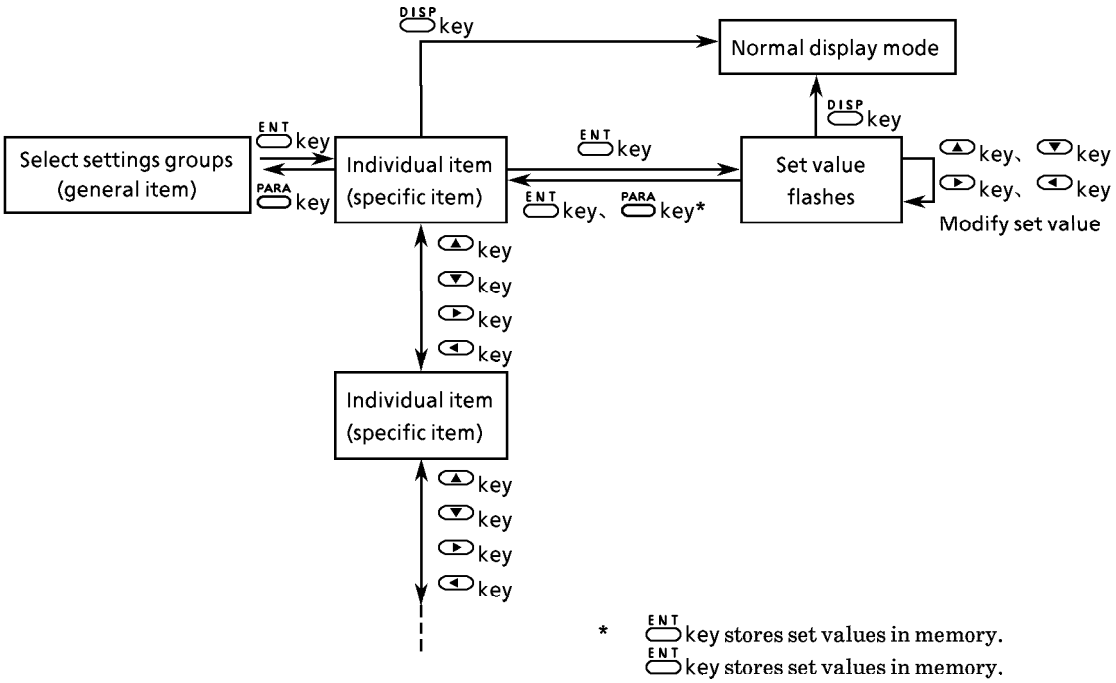
Modification of settings is terminated by pressing either the PARAkey or DISP key. Pressing the PARAkey stops the flashing and the number reverts to its normal on state.

Pressing the DISPkey enables the normal display mode.

Should display panel 2 show [----] during display of an individual item or pressing the ENTkey not enable the registration state, it means that settings cannot be made or modified for that item. The LCK LED appears when items that can only be viewed are displayed.

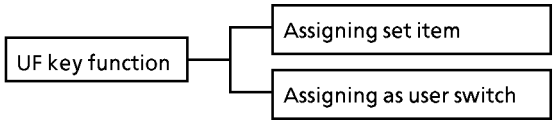
- Example of individual item matrix





7 - 8 Using the UF Keys

The two UF keys (UF1 and UF2) can be programmed to reduce the number of key strokes required for users to execute operations or to function as switches for external digital input.



■ Registering UF key functions

The UF1 and UF2 keys can be registered individually.
The UF.SEt basic registration setting of the UF key processing data is used for basic registration.
UF key basic registration
0: assigned as setting items
1: used as user switch

Handling Precautions The UF key basic registration is set from the loader and can be viewed only from the console.

■ Assigning setting items

Up to eight individual control data and monitor data settings can be assigned to each UF key. However, the functions cannot be used until the assigned settings are registered. Settings are registered using [UF key processing data] UF-01 to UF-08 (assigned settings 1 to 8) settings.
Once registered, the UF1 and UF2 keys can be used to easily call up items normally called using the PARA key.

● Procedures for registering assigned settings

Settings are assigned individually for the UF1 and UF2 keys.
Key settings are registered by adding the settings group radix number, shown below, to the item number and using the sum as the setting to add to [UF key processing data] UF-01 to UF-08 (UF assigned settings 1 to 8).

Radix no.	Settings group
600	Computational unit monitor
1000	Input/output signal monitor
2000	Setup data
2100	Input processing data
2200	Control computational data
2300	PID parameters
2500	Linearization table data
2700	PTB table data
2900	TTB table data
3100	Variable parameters (percentage format)
3200	Variable parameters (time format)
3300	Variable parameters (flag format)
3400	Variable parameters (index format)
3500	Engineering unit parameter
3600	UF key processing data
3700	Digital input processing data
3800	ID data
3900	Protect

● Example of registration

This example describes procedures for assigning four items to the UF1 key. Pressing the UF1 key in the normal display mode enables cycling through and, if desired, modification of values of the four displayed items shown in the table below.

Order	Items selected by UF1 key
1	Setup data C01
2	PID operation P-2
3	Variable parameters (% format) PPR10
4	Variable parameters (time format) tPR03

The following settings are required to register the above items:
UF key processing data [UF]

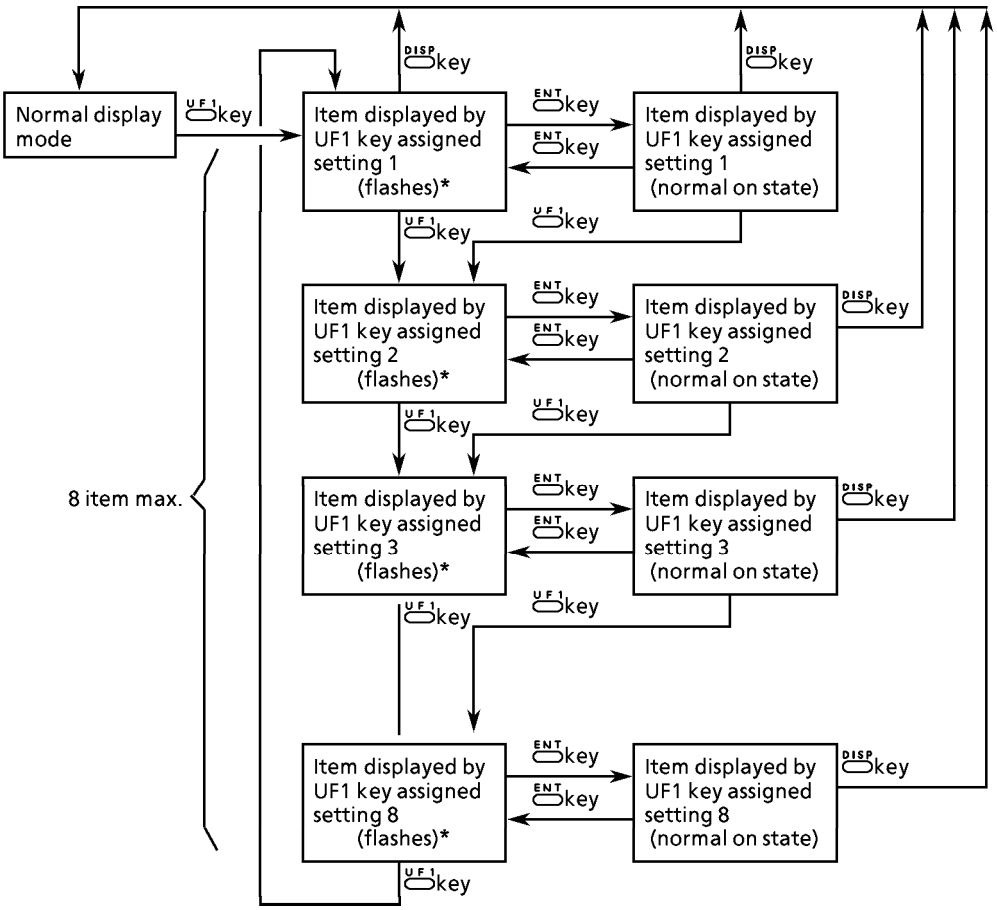
No.	Item code [aux. display]	Item	Set value	Remarks
1	UF.SEt [1]	UF1 key basic registration	0	
2	UF-01 [1]	UF1 key assigned setting 1	2001	The C01 value of item 1 is added to setup data radix 2000 for a sum of 2001.
3	UF-02 [1]	UF1 key assigned setting 2	2325	The P-2 value of item 25 is added to PID parameter radix 2300 for a sum of 2325.
4	UF-03 [1]	UF1 key assigned setting 3	3110	The PPR10 value of item 10 is added to the variable parameter (percentage) radix 3100 for a sum of 3110.
5	UF-04 [1]	UF1 key assigned setting 4	3203	The PPR03 value of item 3 is added to the variable parameter (time) radix 3100 for a sum of 3203.

Handling Precautions

- For a list of item numbers, refer to Section 7-9 List of Control Data and Monitor Data Settings on page 7-18.
- When making UF assigned settings, any settings using values not pertaining to the item in question will be ignored.
  For example, the factory default radix 600 corresponds to computational unit monitor "0", however, as no such item exists, the invalid data is not registered.

● Operating UF keys

Pressing the UF keys in the normal display mode calls up their registered items.
This eliminates having to press the PARA key and carry out a series of operations. Continuing to press the UF keys cycles through their individual registered items (max. of 8). All items called up are only those registered using valid assigned settings.
UF key operation is not restricted by the SEL (transition selection) and Loc (keylock) protect settings.
The UF keys may be operated according to the procedures shown on the following page. Procedures are identical for both keys.


Normal display mode
UF1 key
Item displayed by UF1 key assigned setting 1 (flashes)*
Item displayed by UF1 key assigned setting 1 (normal on state)
Item displayed by UF1 key assigned setting 2 (flashes)*
Item displayed by UF1 key assigned setting 2 (normal on state)
Item displayed by UF1 key assigned setting 3 (flashes)*
Item displayed by UF1 key assigned setting 3 (normal on state)
Item displayed by UF1 key assigned setting 8 (flashes)*
Item displayed by UF1 key assigned setting 8 (normal on state)
8 item max.
DISP key
ENT key
UF1 key

Important Items registered using invalid assigned setting values are skipped and the next registered item is displayed.

* Modifiable items: settings values can be changed using the ▲key, ▼ key, ▶key and ◀key while they are flashing. Pressing the ENT key stores the new values in memory.
View only items: always displayed in normally on state.

■ Using UF Keys as user input switches

When used as switch keys, the UF keys are assigned internal flag format signals UF1 key and UF2 key, which are connected to computational units.

Handling Precautions This function is not available when the settings assigning function is selected at UF key basic registration.

7 - 9 List of Control Data and Monitor Data Settings

■ Setup data settings [SETUP]

No.	Item code	Item	Factory default settings	User settings	Settings and Descriptions
1	C01	Administration no.	0		0 to 30,000 Description: Used for managing configuration data.
2	C02	Computation processing cycle	1		1: 0.1s (100ms) 2: 0.2s (200ms) 3: 0.3s (300ms) 4: 0.4.s (400ms) 5: 0.5s (500ms) Description: Cannot be set in the SDC40B. Processing cycle is determined by adding input processing time and computational unit processing time.
3	C03	Control type	0		0: one PID computation (A/M) 1: one PID computation (A/M/C) 2: two PID computations (A/M/C) 3: two PID computations (A/M/C) Description: Cannot be set in the SDC40B. The ( ) above show the mode changes. A : auto mode M : manual mode C : cascade mode The A ⇔ C change for setting 2 is executed in the PID1 computational unit. The A ⇔ C change for setting 3 is executed in the PID2 computational unit.
4	C04	IM mode transition settings	0		0: no change 1: changed on memory-related error. 2: changed on memory-related error and analog input error. 3: changed on memory-related error, analog input error and computation error
5	C05	Startup method	0		0: cold start 1: hot start Description: Selects startup method used when power is applied.
6	C06	Preset mode	0		0: auto (AUTO) 1: manual (MAN) 2: cascade (CAS) Description: Sets default mode for cold start. Setting 2 is invalid with control type 0. Setting 1 becomes the auto mode when the MAN computational unit is not registered.
7	C07	Preset output	0.0		-10.0 to +110.0% Description: Sets initial values for control output (AO1) during cold start.
8	C08	Preset LSP1	0.0		0.0 to 100.0% Description: Sets LSP1 for PID1 computational unit during cold start.
9	C09	Preset LSP2	0.0		0.0 to 100.0% Description: Sets LSP2 for PID2 computational unit during cold start.
10	C10	Input 1 range type	0		0 - (T/C) [thermocouple] 32 - (RTD) [resistance temperature detector] 64 - 73 (linear) [DC current/voltage] Description: Refer to range numbers listed in Section1-4.

! Handling Precaution Even when hot start is selected, it is important to set the preset parameters in case the RAM backup settings are lost and a cold start is required.

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
11	C11	Input 1 temp. unit	0		0 : °C Celsius 1 : downscaled Description: When input 1 range type is linear, [----] is displayed and setting cannot be performed.
12	C12	Input 1 "0" contact compensation	0		0 : internally compensated 1 : externally compensated Description: When input 1 range type is RTD or linear, [----] is displayed and setting cannot be performed.
13	C13	Input 1 operation during line break	0		0 : upscaled 1 : downscaled Description: Valid when input 1 range type is T/C, RTD or linear (mV listed).
14	C14	Input 2 range type	0		0 : 4 to 20mA 1 : 1 to 5V Description: Refer to range numbers listed in Section 1-4.
15	C15	LSP1 setting method	0		0 : direct change disabled 1 : direct change enabled 2 : LSP1 modify-prevent Description: Governs LSP settings procedures when LSP1 is displayed in normal display mode.
16	C16	LSP2 setting method	0		0 : direct change disabled 1 : direct change enabled 2 : LSP2 modify-prevent Description: Governs LSP settings procedures when LSP2 is displayed in normal display mode.
17	C17	PV/AI display selection	0		0 : PV1 (PID1 computational unit) 1 : PV2 (PID2 computational unit) 2 : AI1 (processed inputs) 3 : AI2 (processed inputs) 4 : AI3 (processed inputs) Description: Selects display items when PV/AI is displayed on display panel 1 in normal display mode. Display is denominated in engineering units.
18	C18	Auto-tuning method selection	0		0 : AT not performed 1to3 : for PID1 computational unit: 1 : normal AT performed 2 : overshoot-proof AT performed 3 : neural network AT performed 4to6 : for PID2 computational unit: 4 : normal AT performed 5 : overshoot-proof AT performe 6 : neural network AT performed Description: AT results are stored in the parameters of the PID groups selected for either PID1 or PID2 computational units. Detailed descriptions of AT processing are provided in the section following this tables.

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
19	C19	Motor control method selection	0		0 : MFB control (conv.) + est. pos. control performed 1 : MFB control (conv.) only performed 2 : est. pos. control (without MFB) only performed Description: With 5G output, [----] is displayed and setting cannot be performed. A detailed description of motor control methods is provided in the section following this table.
20	C20	Automatic motor opening adjustment	0		0 : adjustment disabled 1 : adjustment started Description: When motor control method 2 is used with 5G and 2G output, [----] is displayed and setting cannot be performed. A detailed description of automatic motor opening adjustment is provided in the section following this table.
21	C21	Motor adjustment completely closed	1000		0 to (fully open − 500) Description: When motor control method 2 is used with 5G and 2G output, [----] is displayed and setting cannot be performed. A detailed description of motor opening adjustment is provided in the section following this table.
22	C22	Motor adjustment completely open	9000		(Completely closed + 500) to 10,000 Description: When motor control method 2 is used with 5G and 2G output, [----] is displayed and setting cannot be performed. A detailed description of motor opening adjustment is provided in the section following this table.
23	C23	Motor adjustment completely open to closed time	30.0		5.0 to 240.0s Description: When motor control method 2 is used with 5G output, [----] is displayed and setting cannot be performed. A detailed description of motor opening adjustment is provided in the section following this table.
24	C24	Position proportional control dead zone	5.0		0.5 to 25.0% Description: When motor control method 2 is used with 5G output, [----] is displayed and setting cannot be performed. A detailed description of position proportional control dead zone is provided in the section following this table.
25	C25	CPL communications address	0		0 to 127 Description: When there are no transmission options, [----] is displayed and setting cannot be performed. Selecting "0" inhibits transmission. Note that allowable processing time differs between "0" and all other values.
26	C26	CPL transmission rate, code	0		0 : 9600 bps, even parity, 1 stop bit 1 : 9600 bps, no parity, 2 stop bits 2 : 4800 bps, even parity, 1 stop bit 3 : 4800 bps, no parity, 2 stop bits Description: When there are no transmission options, [----] is displayed and setting cannot be performed.
27	C27	CPL transmission write enable/prevent	0		0: write-enable 1: write-prevent Description: When there are no transmission options, [----] is displayed and setting cannot be performed.
28	C28	Unused	—		[----] is always displayed and setting cannot be performed.
29	C29	Unused	—		[----] is always displayed and setting cannot be performed.
30	C30	Unused	—		[----] is always displayed and setting cannot be performed.

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
31	C31	[Expansion setting] Input 1 burnout current	0		0:burnout current ON 1:burnout current OFF Description Normally set to 0. Set to 1 when infra-red thermocouple RT50 is connected to input 1.
32	C32	[Special function]	0		Default setting is "0". Used for servicing by manufacturer and cannot be set.
33	C33	[Expansion setting] Input 1 zener barrier adjustment	—		Used for servicing by manufacturer and normally shows [----].

■ Detailed descriptions of setup data

● C04

IM mode transition settings
0 : No change
1 : Changed on memory-related error.
2 : Changed on memory-related error and analog input error.
3 : Changed on memory-related error, analog input error and computation error

- The memory-related error indicates the status that the alarm in alarm codes AL97 to AL99 has occurred.
- The analog input error indicates the status that the alarm in alarm codes AL01L to AL09 has occurred.
- The computation error indicates the status that the alarm in alarm codes AL82 to AL83 has occurred.

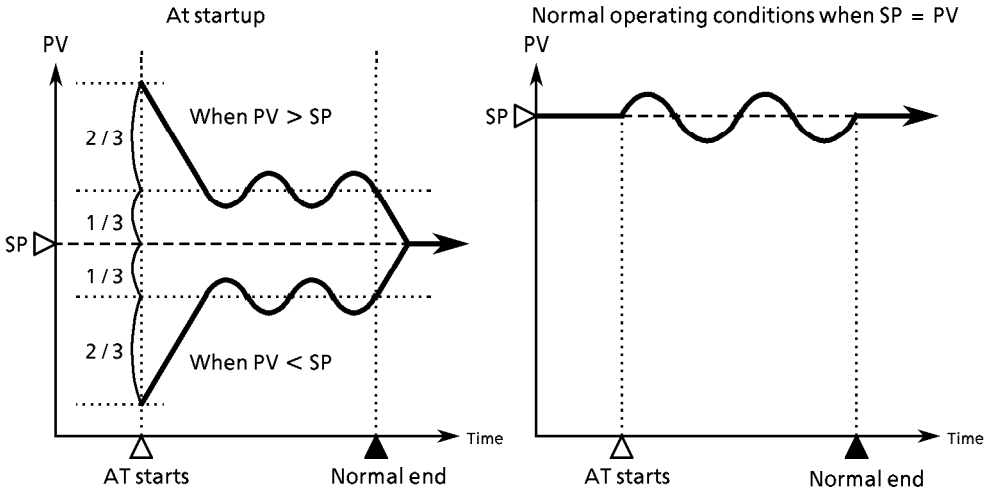
● C18

Auto-tuning (AT) method selection

0	: AT not performed
1, 4	: standard AT performed
2, 5	: overshoot-proof AT performed
3, 6	: neural network AT performed

- Auto-tuning is performed on normal PID computational unit SP, PV and MV values, but does not function with derivative-based PID.
- Auto-tuning always calculates the excess time and limit sensitivity of thread for two limit cycles and calculates PID values using characteristics equations, then automatically writes the results.
- MV fluctuations also cause PV fluctuations during auto-tuning, so check to make sure the PV fluctuations will not induce system breakdown.
- The 1(4) and 3(6) settings provide satisfactory, writable results, however, in the case of overshoot-susceptible thread, use of the 2(5) settings or additional overshoot-suppressing smart tuning is recommended. The 3(6) setting is a neural processing method that provides suitable results for a wider range of applications

- The point at which output reverses (lower limit ↔ upper limit) during auto tuning is determined from the SP and PV values at AT startup as follows.



- Auto-tuning can be started by the AT key, the AT1 and AT2 computational units and by transmission. The AT LED stays on during tuning.
- Auto-tuning terminates without writing PID constants and the AT LED goes off when any of the following conditions occur:
  - Operation is terminated by pressing of the AT key.
  - Operation is terminated by the AT1 or AT2 computational units.
  - Operation is terminated by transmission.
  - Mode change occurs.
    (Auto-tuning cannot be performed during the manual, interlock manual and follow modes.)
  - When automatic motor opening adjustment is performed on 2G models.
  - When the C18 setting is modified.

Handling Precautions

- Using even one of the AT1 or AT2 computational units invalidates the C18 setting.
- Auto-tuning results are calculated using the PID computational unit input/output. Effective auto-tuning results cannot be obtained when PID computational unit input/output is affected by external disturbance.

  Example) Do not perform simultaneous auto-tuning using computational units AT1 and AT2 when using the control type 2 and 3 connections described in Section 5-8 Control Types (page 5-22).
  (In this case, simultaneous auto-tuning will produce invalid results.)

● C 19

Motor control method selection
0: MFB control (conventional) + estimated position control performed
1: MFB control (conventional) only performed
2: estimated position control (without MFB) only performed

- 0: MFB control (conventional) + estimated position control performed
  - When motor feedback (MFB) input is functioning normally, measured MFB is used to control motor position.
  - When motor feedback (MFB) input is not functioning normally, estimated MFB values are used to control motor position. This is referred to as estimated position control.
    For example, MFB feedback will suddenly begin fluctuating when the motor rotates to the point where the feedback potentiometer has deteriorated.
    These sudden fluctuations are regarded as errors and the system begins to estimate correct MFB feedback position.
    The motor also controls position using estimated MFB feedback values when an MFB line-break alarm is issued.
  - Errors necessarily develop between actual motor opening and estimated MFB values during the estimated position control state.
    When output (MV) is less than or equal to 0.0% the close relay is always on, when it is greater than or equal to 100.0% the open relay is always on. The problem is dealt with by compensating the extent of error by setting the motor to be either fully open or fully closed. However, in cases where the output limiter limits MV to the 0.1 to 99.9% range and MV values do not go below 0.0% or above 100.0%, compensation is not possible.
  - The following conditions are regarded as having a tendency to trigger estimated position control.
    · Motor opening is poorly adjusted.
    · Feedback potentiometer has poor resolution or is not functioning properly·
    · Faulty MFB wiring.
- 1: MFB control (conventional) only performed
  This is the conventional method of motor control in which the MFB value is regarded as 150.0% and the close relay is always on when an MFB line-break alarm occurs.
- 2: estimated position control (without MFB) only performed
  - Performs motor position control using only estimated position control using estimated MFB values, regardless of whether MFB wiring is connected.
  - The MFB line-break alarms is not issued
  - Compensates errors that develop between actual motor opening and estimated MFB values by forcing the motor in the closed or open direction when MV values are either 0.0% or 100.0%.

● C20

Automatic motor adjustment
0 : adjustment disabled
1 : adjustment started
Automatically measures the motor's fully open and closed positions and the time required to go from one state to the other and writes the results to C21, C22 and C23.

- Motor operation and adjustment methods
  1. C19 is set to 0 or 1.
  2. C20 is set to 1 and the ENT key pressed.
  3. Automatic adjusting
     Display panel 1 shows CA.CL and the close relay goes on.
     · The motor moves to the close side and display panel 2 shows the MFB count. As the count stabilizes, fully closed adjustment completes and the count is written to C21.
     · Display panel 1 shows CA.OP and the open relay goes on.
     · The motor moves to the open side and display panel 2 shows the MFB count. As the count stabilizes, fully open adjustment completes and the count is written to b.22.The time required to go from fully closed to fully open is written to C23. Note that 240.0s is the upper limit written, even if the time exceeds that number.
     · The normal display screen appears when the adjustment operation completes.
  4. The DISP key is pressed to terminate the adjustment operation.
     Once the automatic adjustment routine begins, all keys become inoperative until the routine completes, power is turned off or the DISP key is pressed.
     · Under these conditions, SDC40B returns to its factory default settings and displays AL12. The AL12 remains on the display until either the automatic adjustment routine is run again and ends normally or the system power supply is reset.
     Fully closed count to fully open count < 500
     Fully closed count > fully open count
     Time from fully closed to fully open is less that 5 seconds.
     MFB line-break alarm (AL10 、 AL11) occurs either continuously or frequently.
     Time required for MFB count to stabilize exceeds 5 minutes.
     Incorrect wiring of MFB or open and closed relays (Note than not all incorrect wiring will be detected as errors.)

● C21

Input when motor is fully closed.
0 to (motor fully open input -500)

● C22

Input when motor is fully open.
(Motor fully closed input +500) to 10,000

● C23

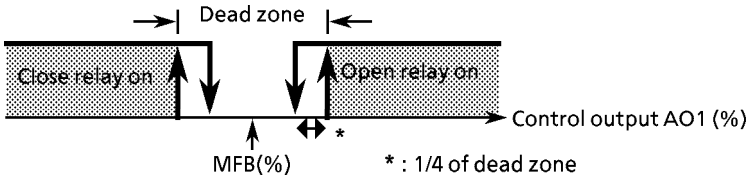
Motor fully closed time
5.9 to 240.0s

Handling Precautions The C21, C22 and C23 values are set when manually adjusting the motor.Only the time for C23 can be set when C19 is 0 or 1 (MFB control enabled) and C21, C22 and C23 are all set to 2 (MFB control disabled). When set to 2, the set time becomes the basis for all calculations. It is important to input time precisely to the nearest 0.1 second.

● C24

Position proportional control dead zone
0.5 to 25.0%

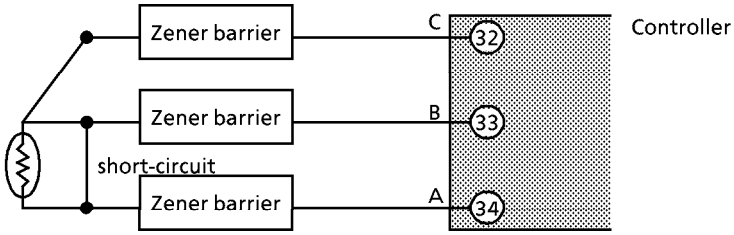
This value is set as the dead zone between the fully open and fully closed positions for the 2G type motor.
The value is determined by operating the motor at a fixed level at manual output, then varying the dead zone and recording the value at which motor "hunting" stops. This becomes the minimum value.
Setting the dead zone very close means the motor will operate constantly, significantly shortening motor life.
The dead zone is factory defaulted to 5%. This figure should be used as a guide when considering control results and motor life.



● C33 (Zener barrier adjustment)

When the Zener barrier is used, be sure to make the following adjustment:

① Turn the power OFF, install the controller, make wiring, and then short-circuit between A and B terminals of RTD.



② After applying the power to this controller, set the setup data C32 to 241.
See, 7-7 Control Data Settings (Page 7-12) for the change method.

③ Indicate the setup data C33 setting.

④ Press the ENT key to indicate the difference in resistance (A-B) of the Zener barriers connected to A and A wires in the 2nd indicator.

⑤ Press the ENT key to memorize the difference in resistance (A-B) this controller.

⑥ Press the DISP key to display the basic indicationstatus.

⑦ Turn the power OFF and then remove the short-circuit connected between A and B terminals.

Handling Precautions

- Zener barrier can be used only for the RTD ranges other than F01, F33, F38, P01, P33 and P38.
- Adjustment can not be made if the difference in resistance of Zener barriers connected to A and B wires is not within 20Ω.
- Use the Zener barrier of less than 70Ω direct current resistance.
- his adjustment is not required for the inputs other than RTD or if Zener barrier is not used.
- Once the Zener barrier adjustment is made, calibration to the Zener barrier is performed. If used with RTD input without Zener barrier, make again the adjustment without Zener barrier.

■ Input processing data settings [I n]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	I n 0 1 [1]	Input 1	0		0: not used 1: used Description: This setting not available on the SDC40B. Input 1 is not processed when set to "0". For No. 2 to 15, [----] is displayed and setting cannot be performed.
2	I n 0 2 [1]	Engineering unit display 1 decimal point position	1		0 to 4 Description: This setting not available on the SDC40B. Can be viewed with input 1 range types T/C and RTD, but settings cannot be made.
3	I n 0 3 [1]	Engineering unit display 1 Lower limit 0%	0		19,999 to +26,000U Description: Can be viewed with input 1 range types T/C and RTD, but settings cannot be made. Specifies engineering unit value for linear input 0%. The numbers for I n 0 3 and I n 0 4 can be either large or small. Engineering units are expressed using the decimal point position of display 1 settings.
4	I n 0 4 [1]	Engineering unit value display 1 upper limit 100%	12000		-19,999 to +26,000U Description: Can be viewed with input 1 range types T/C and RTD, but settings cannot be made. Specifies engineering unit value for linear input 100%. The numbers for I n.0 3 and I n.0 4 can be either large or small. Engineering units are expressed using the decimal point position of display 1 settings.
5	I n 0 5 [1]	Linearization table 1	0		0: linearization approximation processing not used 1: linearization table 1 used 2: linearization table 2 used 3: linearization table 3 used Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD, [----] is displayed.
6	I n 0 6 [1]	Temperature compensation input 1	0		0: temperature not compensated 1: temperature compensated with input 1 2: temperature compensated with input 2 3: temperature compensated with input 3 Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD, [----] is displayed. Normal compensation cannot be performed with setting "1".
7	I n 0 7 [1]	Temperature compensation temperature unit 1	0		0: °C 1: °F Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD and when temperature compensation input 1 is set to "0", [----] is displayed and setting cannot be performed.
8	I n 0 8 [1]	Temperature compensation design temperature 1	0		-19,999 to +26,000U Description: For input 1 range types T/C and RTD and when temperature compensation input 1 is set to "0", [----] is displayed and setting cannot be performed. Displayed using the decimal point position specified by temperature compensation input 1.

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
9	I n 0 9 [1]	Pressure compensation input 1	0		0: pressure not compensated 1: pressure compensated with input 1 2: pressure compensated with input 2 3: pressure compensated with input 3 Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD, [----] is displayed. Normal compensation cannot be performed with setting "1".
10	I n 1 0 [1]	Pressure compensation pressure unit 1	0		0: MPa 1: kPa 2: Pa 3: kgf/cm^2 4: mmH_2O Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD and when temperature compensation input 1 is set to "0", [----] is displayed.
11	I n 1 1 [1]	Pressure compensation design pressure 1	0		-19,999 to + 26,000U Description: For input 1 range types T/C and RTD and when temperature compensation input 1 is set to "0", [----] is displayed and setting cannot be performed. Displayed using the decimal point position specified by pressure compensation input 1.
12	I n 1 2 [1]	Square-root extraction computation 1	0		0: square-root extraction not performed 1: square-root extraction computation performed Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD, [----] is displayed.
13	I n 1 3 [1]	Square-root extraction dropout value 1	0.0		0.0 to 100.0% Description: For input 1 range types T/C and RTD and when square-root extraction 1 is set to "0", [----] is displayed and setting cannot be performed.
14	I n 1 4 [1]	Digital filter	0.0		0.0 to 120.0 s Description: When set to 0.0, filtering is not performed.
15	I n 1 5 [1]	Input failure diagnosis 1	0		0: diagnostics not performed 1: diagnostics performed Description: This setting not available on the SDC40B. When input 1 exceeds the -10.0 to + 110.0 range with diagnostics specified, the input 1 failure alarm goes off.
16	I n 0 1 [2]	Input 2	0		0: not used 1: used Description: This setting not available on the SDC40B. Input 2 is not processed when set to "0". For No. 17 to 30, [----] is displayed and setting cannot be performed.
17	I n 0 2 [2]	Engineering unit display 2 decimal point position	0		0 to 4 Description: This setting not available on the SDC40B.
18	I n 0 3 [2]	Engineering unit value setting 2 Lower limit 0%	0		-19,999 to + 26,000U Description: Specifies engineering unit value for linear input 0%. The numbers for I n 0 3 and I n 0 4 can be either large or small. Engineering units are expressed using the decimal point position of display 2 settings.

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
19	I n04 [2]	Engineering unit value display 2 upper limit 100%	10000		-19,999 to +26,000U Description: Can be viewed with input 1 range types T/C and RTD, but settings cannot be made. Specifies engineering unit value for linear input 100%. The numbers for I n03 and I n04 can be either large or small. Engineering units are expressed using the decimal point position of display 2 settings.
20	I n05 [2]	Linearization table 2	0		0 : linearization approximation processing not used 1 : linearization table 1 used 2 : linearization table 2 used 3 : linearization table 3 used Description: This setting not available on the SDC40B.
21	I n06 [2]	Temperature compensation input 2	0		0 : temperature not compensated 1 : temperature compensated with input 1 2 : temperature compensated with input 2 3 : temperature compensated with input 3 Description: This setting not available on the SDC40B. Normal compensation cannot be performed with setting "2".
22	I n07 [2]	Temperature compensation temperature unit 2	0		0 : °C 1 : °F Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD and when temperature compensation input 2 is set to "0", [----] is displayed.
23	I n08 [2]	Temperature compensation design temperature 2	0		-19,999 to +26,000U Description: When temperature compensation input 2 is set to "0", [----] is displayed and setting cannot be performed. Displayed using the decimal point position specified by temperature compensation input 2.
24	I n09 [2]	Pressure compensation input 2	0		0 : pressure not compensated 1 : pressure compensated with input 1 2 : pressure compensated with input 2 3 : pressure compensated with input 3 Description: This setting not available on the SDC40B. Normal compensation cannot be performed with setting "2".
25	I n10 [2]	Pressure compensation pressure unit 2	0		0 : MPa 1 : kPa 2 : Pa 3 : kgf/cm^2 4 : mmH_2O Description: This setting not available on the SDC40B. When temperature compensation input 2 is set to "0", [----] is displayed.
26	I n11 [2]	Pressure compensation design pressure 2	0		-19,999 to +26,000U Description: When temperature compensation input 2 is set to "0", [----] is displayed and setting cannot be performed. Displayed using the decimal point position specified by pressure compensation input 2.
27	I n12 [2]	Square-root extraction computation 2	0		0 : square-root extraction computation not performed 1 : square-root extraction computation performed Description: This setting not available on the SDC40B.

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
28	In13 [2]	Square-root extraction dropout value 2	0.0		0.0 to 100.0% Description: When square-root extraction 2 is set to "0", [----] is displayed and setting cannot be performed.
29	In14 [2]	Digital filter	0.0		0.0 to 120.0 s Description: When set to 0.0, filtering is not performed.
30	In15 [2]	Input failure diagnosis 2	0		0: diagnostics not performed 1: diagnostics performed Description: This setting not available on the SDC40B. When input 2 exceeds the -10.0 to +110.0 range with diagnostics specified, the input 2 failure alarm goes off.
31	In01 [3]	Input 3	0		0: not used 1: used Description: This setting not available on the SDC40B. Input 3 is not processed when set to "0". For No. 32 to 45, [----] is displayed and setting cannot be performed.
32	In02 [3]	Engineering unit display 3 decimal point position	0		0 to 4 Description: This setting not available on the SDC40B.
33	In03 [3]	Engineering unit value setting 3 lower limit 0%	0		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 0%. The numbers for In03 and In04 can be either large or small. Engineering units are expressed using the decimal point position of display 3 settings.
34	In04 [3]	Engineering unit value display 3 upper limit 100%	10000		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 100%. The numbers for In03 and In04 can be either large or small. Engineering units are expressed using the decimal point position of display 3 settings.
35	In05 [3]	Linearization table 3	0		0: linearization approximation processing not used 1: linearization table 1 used 2: linearization table 2 used 3: linearization table 3 used Description: This setting not available on the SDC40B.
36	In06 [3]	Temperature compensation input 3	0		0: temperature not compensated 1: temperature compensated with input 1 2: temperature compensated with input 2 3: temperature compensated with input 3 Description: This setting not available on the SDC40B. Normal compensation cannot be performed with setting "3".
37	In07 [3]	Temperature compensation temperature unit 3	0		0: °C 1: °F Description: This setting not available on the SDC40B. For input 1 range types T/C and RTD and when temperature compensation input 3 is set to "0", [----] is displayed.
38	In08 [3]	Temperature compensation design temperature 3	0		-19,999 to +26,000U Description: When temperature compensation input 3 is set to "0", [----] is displayed and setting cannot be performed. Displayed using the decimal point position specified by temperature compensation input 3.

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
39	I n09 [3]	Pressure compensation input 3	0		0: pressure not compensated 1: pressure compensated with input 1 2: pressure compensated with input 2 3: pressure compensated with input 3 Description: This setting not available on the SDC40B. Normal compensation cannot be performed with setting "3".
40	I n10 [3]	Pressure compensation pressure unit 3	0		0: MPa 1: kPa 2: Pa 3: kgf/cm^2 4: mmH_2O Description: This setting not available on the SDC40B. When temperature compensation input 3 is set to "0", [----] is displayed.
41	I n11 [3]	Pressure compensation design pressure 3	0		-19,999 to +26,000U Description: When temperature compensation input 3 is set to "0", [----] is displayed and setting cannot be performed. Displayed using the decimal point position specified by pressure compensation input 3.
42	I n12 [3]	Square-root extraction computation 3	0		0: square-root extraction computation not performed 1: square-root extraction computation performed Description: This setting not available on the SDC40B.
43	I n13 [3]	Square-root extraction dropout value 3	0		0.0 to 100.0% Description: When square-root extraction 3 is set to "0", [----] is displayed and setting cannot be performed.
44	I n14 [3]	Digital filter	0.0		0.0 to 120.0s Description: When set to 0.0, filtering is not performed.
45	I n15 [3]	Input failure diagnosis 3	0		0: diagnostics not performed 1: diagnostics performed Description: This setting not available on the SDC40B. When input 3 exceeds the -10.0 to +110.0 range with diagnostics specified, the input 3 failure alarm goes off.
46	I n01 [4]	Input 4	0		0: not used 1: used Description: This setting not available on the SDC40B. When set to "0", [----] is displayed for No. 47 to 49, and setting cannot be performed. Input 4 provides data used specifically for displaying engineering unit values, so there is no actual analog input.
47	I n02 [4]	Engineering unit display 4 decimal point position	0		0 to 4 Description: This setting not available on the SDC40B.
48	I n03 [4]	Engineering unit value setting 4 lower limit 0%	0		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 0%. The numbers for I n03 and I n04 can be either large or small. Engineering units are expressed using the decimal point position of display 4 settings.

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
49	In04 [4]	Engineering unit value setting 4 upper limit 100%	10000		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 100%. The numbers for In03 and In04 can be either large or small. Engineering units are expressed using the decimal point position of display 4 settings.
50 ~ 60	In05 [4] ~ In15 [4]	Unused	—		[----] is always displayed and setting cannot be performed.
61	In01 [5]	Input 5	0		0: not used 1: used Description: This setting not available on the SDC40B. When set to "0", [----] is displayed for No. 62 to 64, and setting cannot be performed. Input 5 provides data used specifically for displaying engineering unit values, so there is no actual analog input.
62	In02 [5]	Engineering unit display5 decimal point position	0		0 to 4 Description: This setting not available on the SDC40B.
63	In03 [5]	Engineering unit value setting 5 lower limit 0%	0		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 0%. The numbers for In03 and In04 can be either large or small. Engineering units are expressed using the decimal point position of display 5 settings.
64	In04 [5]	Engineering unit value setting 5 Upper limit 100%	0		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 100%. The numbers for In03 and In04 can be either large or small. Engineering units are expressed using the decimal point position of display 5 settings.
65 ~ 75	In05 [5] ~ In15 [5]	Unused	—		[----] is always displayed and setting cannot be performed.
76	In1 [6]	Input 6	0		0: not used 1: used Description: This setting not available on the SDC40B. When set to "0", [----] is displayed for No. 77 to 79, and setting cannot be performed. Input 6 provides data used specifically for displaying engineering unit values, so there is no actual analog input.
77	In02 [6]	Engineering unit display6 decimal point position	0		0 to 4 Description: This setting not available on the SDC40B.
78	In03 [6]	Engineering unit value setting 6 lower limit 0%	0		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 0%. The numbers for In03 and In04 can be either large or small. Engineering units are expressed using the decimal point position of display 6 settings.
79	In04 [6]	Engineering unit value setting 6 upper limit 100%	10000		-19,999 to +26,000U Description: Specifies engineering unit value for linear input 100%. The numbers for In03 and In04 can be either large or small. Engineering units are expressed using the decimal point position of display 6 settings.

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
80 〜 90	In05 [6] 〜 In15 [6]	Unused	—		[----] is always displayed and setting cannot be performed.

■ Control computational data settings [cont1]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	PId.tP [1]	PID computation method 1	0		0: normal PID 1: derivative-based PID Description: This setting not available on the SDC40B. Selects computation mode for the PID1 computational unit.
2	PId.no [1]	PID group specification 1	0		0 to 7 Description: Specifies PID parameter groups used with the PID1 computational unit.
3	Rct [1]	Control 1	0		0: reverse operation 1: normal operation Description: Selects PID1 computational unit control operation.
4	Pu-In [1]	Engineering unit number specification 1	1		1 to 6 Description: This setting not available on the SDC40B. Displays the PID1 computational unit's PV (PV1) and SP (SP1) in engineering units corresponding to type of input. Specifies the input 1 to 6 numbers for [input processing data].
5	Pu-tr [1]	PV tracking 1	0		0: PV tracking not used 1: PV tracking used Description: This setting not available on the SDC40B. PV tracking is a function that creates the LSP1 = PV1 condition during the manual and interlock manual modes.
6	rR [1]	Ratio 1	100.0		-999.9 to +999.9% Description: Sets ratios in percent for the PID1 computational unit's RSP (RSP1).
7	bIAS [1]	Bias 1	0.0		-999.9 to +999.9% Description: Sets bias in percent for the PID1 computational unit's RSP (RSP1).
8	dEu.AL [1]	Deviation alarm 1	10.0		0.0 to 100.0% Description: Sets absolute value deviation alarm |SP1 to PV1| in percent for the PID1 computational unit.
9	PuL.AL [1]	PV alarm lower limit 1	0.0		-10.0 to 110.0% Description: Sets the PV (PV1) alarm in percent for the PID1 computational unit.
10	PuH.AL [1]	PV alarm upper limit 1	100.0		-10.0 to 110.0% Description: Sets the PV (PV1) alarm in percent for the PID1 computational unit.
11	AL.HYS [1]	Alarm hysteresis	1.0		0.0 to 100.0% Description: Sets the alarm hysteresis in percent for deviation alarm 1 and the PV alarm (upper and lower).
12	IoUt [1]	PID computation initial control variable 1	0.0		0.0 to 100.0% Description: Control input variable for initializing computations used in the PID1 computational unit.

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
13	rPId [1]	PID computation initializing method 1	0		0 : initialization automatically detected 1 : initialized at LSP1 changes 2 : not initialized Description: Selects initializing for the PID1 computational unit.
14	St [1]	Smart tuning method 1	0		0 : smart tuning not performed 1 : overshooting suppressed by fixing brake values 2 : overshooting suppressed by constant checking of brake values Description: Selects smart tuning method for the PID1 computational unit. Smart tuning is not possible when PID computation mode 1 = 1 (derivative-based PID). Also, [----] is always displayed for this item and setting cannot be performed. The "brake" item is contained in [PID parameter] settings. Detailed description of smart tuning is provided in the section following this table.
15	2PId [1]	PID with two degrees of freedom 1	0		0 : two degrees of freedom not used 1 : two degrees of freedom used Description: Selects two degrees of freedom for the PID1 computational unit. The two degrees of freedom function is unavailable when PID computation mode 1 is set to 1 (derivative-based PID). Also, [----] is always displayed for this item and setting cannot be performed. Detailed description of two degrees of freedom is provided in the section following this table.
16	PId.tP [2]	PID computation mode 2	0		0 : normal PID 1 : derivative-based PID Description: This setting not available on the SDC40B. Selects computation mode for the PID2 computational unit.
17	PId.no [2]	PID group specification 2	0		0 to 7 Description: Specifies the PID parameter groups used with the PID2 computational unit.
18	Act [2]	Control 2	0		0 : reverse operation 1 : normal operation Description: Selects PID2 computational unit control operation.
19	Pu-In [2]	Engineering unit number specification 2	1		1 to 6 Description This setting not available on the SDC40B. Displays the PID2 computational unit's PV (PV2) and SP (SP2) in engineering units corresponding to type of input. Specifies the input 1 to 6 numbers for [input processing data].
20	Pu-tr [2]	PV tracking 2	0		0 : PV tracking not used 1 : PV tracking used Description: This setting not available on the SDC40B. PV tracking is a function that creates the LSP2 = PV2 condition during the manual and interlock manual modes.
21	rR [2]	Ratio 2	100.0		-999.9 to +999.9% Description: Sets ratios in percent for the PID2 computational unit's RSP (RSP2).

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
22	bIAS [2]	Bias 2	0.0		-999.9 to +999.9% Description: Sets bias in percent for the PID2 computational unit's RSP (RSP2).
23	dEv.AL [2]	Deviation alarm 2	10.0		0.0 to 100.0% Description: Sets absolute value deviation alarm |SP2 to PV2| in percent for the PID2 computational unit.
24	PvL.AL [2]	PV alarm lower limit 2	0.0		-10.0 to 110.0% Description: Sets the PV (PV2) alarm in percent for the PID2 computational unit.
25	PvH.AL [2]	PV alarm upper limit 2	100.0		-10.0 to 110.0% Description: Sets the PV (PV2) alarm in percent for the PID2 computational unit.
26	AL.HYS [2]	Alarm hysteresis	1.0		0.0 to 100.0% Description: Sets the alarm hysteresis in percent for deviation alarm 2 and the PV alarm (upper and lower).
27	IoUt [2]	PID computation initial control variable 2	0.0		0.0 to 100.0% Description: Control input variable for initializing operations used in the PID2 computational unit.
28	rPId [2]	PID computation initializing method 2	0		0 : initialization automatically detected 1 : initialized at LSP2 changes 2 : not initialized Description: Selects initializing for the PID2 computational unit.
29	St [2]	Smart tuning method 2	0		0 : smart tuning not performed 1 : overshooting suppressed by fixing brake values 2 : overshooting suppressed by constant checking of brake values Description: Selects smart tuning method for the PID2 computational unit. Smart tuning is not possible when PID computation mode 2 = 1 (derivative-based PID). Also, [----] is always displayed for this item and setting cannot be performed. The brake item is contained in [PID parameter settings]. A detailed description of smart tuning is provided in the section following this table.
30	2PId [2]	PID with two degrees of freedom 2	0		0 : two degrees of freedom not used 1 : two degrees of freedom used Description: Selects two degrees of freedom for the PID2 computational unit. The two degrees of freedom function is unavailable when PID computation mode 2 is set to 1 (derivative-based PID). Also, [----] is always displayed for this item and setting cannot be performed. A detailed description of two degrees of freedom is provided in the section following this table.

■ Detailed descriptions of control computational data

● 5t

Smart tuning method selection (1, 2) (Overshooting suppression control)
0 : smart tuning not performed (no overshooting suppression control)
1 : overshooting suppressed by fixing brake values (using settings)
2 : overshooting suppressed by automatic checking of brake values

- Smart tuning does not function with derivative-based PID.
- This function suppresses the overshooting that occurs when control direction is reversed and the undershooting that occurs in normal direction. These two functions together are referred to as overshoot suppression.
  When set to "1", overshoot is suppressed by using the PID parameter's br value as is.
  When set to "2", overshoot is suppressed by sampling and rewriting the br value on each rising (reverse operation) and falling (normal operation) edge.
  In this case, the br value is only rewritten when it increases, which means that the overshoot suppressing effect only gets stronger.
  The result of operating at the "2" setting is that the overshoot suppressing effect becomes too strong and takes significantly longer to reach the set point (SP) value. The solution is to record the br value at the point overshooting stops and set 5t to "1", then reset the br to that value.
- The AT LED stays on while the br value is being sampled and rewritten.
- Do not use the "2" setting in a situation when normal control is not being performed due to the unsuitable tuning effect of the PID constant.
  A high br value tends to cause hunting in threads with fast rising times. The br value should be set to "0" prior to operating at the "2" setting.

● 2PId

Two degrees of freedom PID selection (1, 2)
0 : two degrees of freedom not used
1 : two degrees of freedom used

- The two degrees of freedom PID does not function with derivative-based PID.
- The two degrees of freedom function is effective in improving disturbance response characteristics during operation without affecting existing rising and falling edge characteristics.
  When set to "1", optimum PID constants (in addition to the existing ones) can be set individually to suppress disturbance.
  These constants are automatically set and stored in memory when auto-tuning is performed, but can also be set and modified individually.
  Manually applying mild disturbance-suppressing PID derivatives is particularly effective when wishing to extend motor life by suppressing MV fluctuations to reduce frequency of motor operation.
- PID constants are automatically switched by applying fuzzy rules to deviation and PV gradients.
  The console's FZY LED lights when PID disturbance constants are in use and flashes when fuzzy switching is in progress.
- When I is set to "0", all states are controlled without integral operation, regardless of the value set for the dI disturbance setting.

■ PID parameter settings [PId]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	P-0 [1]	Proportional band 0	100.0		P : 0.1 to 999.9% I : 0.0 to 6000.0s (no integral operation when set to 0.0) d : 0.0 to 6000.0s (no integral operation when set to 0.0) rL : -200.0% to integral upper limit rH : integral lower limit to 200.0% SAP : 0.0 to 100.0% (dead band inoperative when set to 0.0) otL : 0.0 to 100.0% (no limit when set to 0.0) rE : 0.0 to 100.0% br : 0 to 30 (brake inoperative at "0") dP : 0.1 to 999.9% dI : 0.1 to 6000.0s dd : 0.l to 6000.0s (no derivative operation when set to 0.0) Description: · Optimum control parameters (P, I, d) during modification of SP values and optimum disturbance suppressing parameters ([dP, dI, dd) during operation are automatically switched for PID computational units with "1" set for the two degrees of freedom setting in [control computational data]. · Setting smaller values for the proportional band (P, dP) improves control but tends to cause overshooting and hunting. Care should be taken not to set values that are too low, as doing so can shorten the operating life of motor actuators, etc. · Setting smaller values for the integral time (I, dI) improves follow characteristics but tends to cause integral operation cycling. And when I is set to "0", disturbance suppressed integral operation does not function. · Setting larger values for the integral time (d, dd) improves overshoot suppression but tends to result in hunting caused by minute PV movements. Setting derivative time to between 1/4 to 1/3 of integral time is generally considered appropriate for normal temperature control. It is common to use the 0.0 setting to inhibit derivative operation or a very low setting to enable a minute level to avoid the hunting that it tends to cause with pressure and flow rate control. · Integral operation no longer functions when the control variable output falls within the range of the upper and lower integral limits (rL, rH). It prevents the reset windup that occurs when the PV does not rise for extended lengths of time. · The dead band (SAP) is designed to set deviation to "0" for PID operation when absolute deviation values are less than the numeric values. This prevents, from affecting control, the excess PV disturbance or actuator valve hysteresis induced minute vibration that occurs when deviation nears the "0" range.
2	I -0 [2]	Integral time 0	0.0		
3	d-0 [3]	Derivative time 0	0.0		
4	rL-0 [4]	Integral lower limit 0	0.0		
5	rH-0 [5]	Integral upper limit 0	100.0		
6	SAP-0 [6]	Dead band 0	0.0		
7	otL-0 [7]	Output deviation rate limit 0	100.0		
8	rE-0 [8]	Manual reset 0	50.0		
9	br-0 [9]	Brake 0	0		
10	dP-0 [10]	Disturbance suppressing proportional band 0	100.0		
11	dI-0 [11]	Disturbance suppressing integral time 0	120.0		
12	dd-0 [12]	Disturbance suppressing derivative time 0	0.0		
13	P-1 [13]	Proportional band 1	100.0		
14	I -1 [14]	Integral time 1	0.0		
15	d-1 [15]	Derivative time 1	0.0		
16	rL-1 [16]	Integral lower limit 1	0.0		
17	rH-1 [17]	Integral upper limit 1	100.0		
18	SAP-1 [18]	Dead band 1	0.0		
19	otL-1 [19]	Output deviation rate limit 1	100.0		
20	rE-1 [20]	Manual reset 1	50.0		
21	br-1 [21]	Brake 1	0		
22	dP-1 [22]	Disturbance suppressing proportional band 1	100.0		
23	dI-1 [23]	Disturbance suppressing integral band 1	120.0		
24	dd-1 [24]	Disturbance suppressing derivative time 1	0.0		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
25	P-2 [25]	Proportional band 2	100.0		· The output deviation rate limit otL restricts the control variable fluctuations for each control cycle to be within the numeric values. It should be set to 0.1 or greater in conditions where sudden fluctuations in the control variable output has an adverse effect on the actuator. The smaller the value the smaller the fluctuation becomes. · The manual reset rE setting, designed to eliminate the offset that develops during proportional operation (no integral operation), sets a control variable suited to deviation of "0". When integral time I does not equal "0", [----] is displayed and setting cannot be performed. · Setting a larger value for the brake br improves the overshoot suppressing effect but also extends rise time. The brake becomes inoperative, regardless of the br value, for PID computational with "1" set as the PID computation mode (derivative-based PID) or with "0" set as the smart tuning method in the [control computational data]. · The two degrees of freedom function becomes inoperative, regardless of the dP, dI or dd settings, for PID computational units with "1" set as the PID computation mode (derivative-based PID) or with "0" set as the two degrees of freedom setting in the [control computational data]. · The dead band becomes inoperative, regardless of the 9AP setting, for PID computational units with "1" set as the PID computation mode (derivative-based PID) in the [control computational data]. · When integral time I is set to "0" for disturbance suppressing integral time dI , [----] is displayed and setting cannot be performed.
26	I -2 [26]	Integral time 2	0.0		
27	d-2 [27]	Derivative time 2	0.0		
28	rL-2 [28]	Integral lower limit 2	0.0		
29	rH-2 [29]	Integral upper limit 2	100.0		
30	9AP-2 [30]	Dead band 2	0.0		
31	otL-2 [31]	Output deviation rate limit 2	100.0		
32	rE-2 [32]	Manual reset 2	50.0		
33	br-2 [33]	Brake 2	0		
34	dP-2 [34]	Disturbance suppressing proportional band 2	100.0		
35	dI-2 [35]	Disturbance suppressing integral band 2	120.0		
36	dd-2 [36]	Disturbance suppressing derivative time 2	0.0		
37	P-3 [37]	Proportional band 3	100.0		
38	I -3 [38]	Integral time 3	0.0		
39	d-3 [39]	Derivative time 3	0.0		
40	rL-3 [40]	Integral lower limit 3	0.0		
41	rH-3 [41]	Integral upper limit 3	100.0		
42	9AP-3 [42]	Dead band 3	0.0		
43	otL-3 [43]	Output deviation rate limit 3	100.0		
44	rE-3 [44]	Manual reset 3	50.0		
45	br-3 [45]	Brake 3	0		
46	dP-3 [46]	Disturbance suppressing proportional band 3	100.0		
47	dI-3 [47]	Disturbance suppressing integral band 3	120.0		
48	dd-3 [48]	Disturbance suppressing derivative time 3	0.0		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
49	P-4 [49]	proportional band 4	100.0		
50	I -4 [50]	Integral time 4	0.0		
51	d-4 [51]	Derivative time 4	0.0		
52	rL-4 [52]	Integral lower limit 4	0.0		
53	rH-4 [53]	Integral upper limit 4	100.0		
54	9AP-4 [54]	Dead band 4	0.0		
55	otL-4 [55]	Output deviation rate limit 4	100.0		
56	rE-4 [56]	Manual reset 4	50.0		
57	br-4 [57]	Brake 4	0		
58	dP-4 [58]	Disturbance suppressing proportional band 4	100.0		
59	dI -4 [59]	Disturbance suppressing integral band 4	120.0		
60	dd-4 [60]	Disturbance suppressing derivative time 4	0.0		
61	P-5 [61]	Proportional band 5	100.0		
62	I -5 [62]	Integral time 5	0.0		
63	d-5 [63]	Derivative time 5	0.0		
64	rL-5 [64]	Integral lower limit 5	0.0		
65	rH-5 [65]	Integral upper limit 5	100.0		
66	9AP-5 [66]	Dead band 5	0.0		
67	otL-5 [67]	Output deviation rate limit 5	100.0		
68	rE-5 [68]	Manual reset 5	50.0		
69	br-5 [69]	Brake 5	0		
70	dP-5 [70]	Disturbance suppressing proportional band 5	100.0		
71	dI -5 [71]	Disturbance suppressing integral band 5	120.0		
72	dd-5 [72]	Disturbance suppressing derivative time 5	0.0		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
73	P-6 [73]	Proportional band 6	100.0		
74	I -6 [74]	Integral time 6	0.0		
75	d-6 [75]	Derivative time 6	0.0		
76	rL-6 [76]	Integral lower limit 6	0.0		
77	rH-6 [77]	Integral upper limit 6	100.0		
78	SAP-6 [78]	Dead band 6	0.0		
79	otL-6 [79]	Output deviation rate limit 6	100.0		
80	otL-6 [80]	Manual reset 6	50.0		
81	br-6 [81]	Brake 6	0		
82	dP-6 [82]	Disturbance suppressing proportional band 6	100.0		
83	dI -6 [83]	Disturbance suppressing integral band 6	120.0		
84	dd-6 [84]	Disturbance suppressing derivative time 6	0.0		
85	P-7 [85]	Proportional band 7	100.0		
86	I -7 [86]	Integral time 7	0.0		
87	d-7 [87]	Derivative time 7	0.0		
88	rL-7 [88]	Integral lower limit 7	0.0		
89	rH-7 [89]	Integral upper limit 7	100.0		
90	SAP-7 [90]	Dead band 7	0.0		
91	otL-7 [91]	Output deviation rate limit 7	100.0		
92	rE-7 [92]	Manual reset 7	50.0		
93	br-7 [93]	Brake 7	0		
94	dP-7 [94]	Disturbance suppressing proportional band 7	100.0		
95	dI -7 [95]	Disturbance suppressing integral band 7	120.0		
96	dd-7 [96]	Disturbance suppressing derivative time 7	0.0		

■ Linearization table data settings [tbL]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	tL.A01 [1]	X axis point A01 of linearization table 1	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item [Bn] is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16. Linearization that excludes the point of deviation is performed when the small-to-large relationship does not follow the number order.
2	tL.A02 [1]	X axis point A02 of linearization table 1	999.9		
3	tL.A03 [1]	X axis point A03of linearization table 1	999.9		
4	tL.A04 [1]	X axis point A04 of linearization table 1	999.9		
5	tL.A05 [1]	X axis point A05 of linearization table 1	999.9		
6	tL.A06 [1]	X axis point A06 of linearization table 1	999.9		
7	tL.A07 [1]	X axis point A07 of linearization table 1	999.9		
8	tL.A08 [1]	X axis point A08 of linearization table 1	999.9		
9	tL.A09 [1]	X axis point A09 of linearization table 1	999.9		
10	tL.A10 [1]	X axis point A10 of linearization table 1	999.9		
11	tL.A11 [1]	X axis point A11 of linearization table 1	999.9		
12	tL.A12 [1]	X axis point A12 of linearization table 1	999.9		
13	tL.A13 [1]	X axis point A13 of linearization table 1	999.9		
14	tL.A14 [1]	X axis point A14 of linearization table 1	999.9		
15	tL.A15 [1]	X axis point A15 of linearization table 1	999.9		
16	tL.A16 [1]	X axis point A16 of linearization table 1	999.9		
17	[1]	Unused	—		[----] is always displayed and setting cannot be performed.
18	tL.b01 [1]	Y-axis point B01 of linearization table 1	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
19	tL.b02 [1]	Y-axis point B02 of linearization table 1	999.9		
20	tL.b03 [1]	Y-axis point B03 of linearization table 1	999.9		
21	tL.b04 [1]	Y-axis point B04 of linearization table 1	999.9		
22	tL.b05 [1]	Y-axis point B05 of linearization table 1	999.9		
23	tL.b06 [1]	Y-axis point B06 o linearization table 1	999.9		
24	tL.b07 [1]	Y-axis point B07 of linearization table 1	999.9		
25	tL.b08 [1]	Y-axis point B08 of linearization table 1	999.9		
26	tL.b09 [1]	Y-axis point B09 of linearization table 1	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
27	tL.b10 [1]	Y-axis point B10 of linearization table 1	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
28	tL.b11 [1]	Y-axis point B11 of linearization table 1	999.9		
29	tL.b12 [1]	Y-axis point B12 of linearization table 1	999.9		
30	tL.b13 [1]	Y-axis point B13 of linearization table 1	999.9		
31	tL.b14 [1]	Y-axis point B14 of linearization table 1	999.9		
32	tL.b15 [1]	Y-axis point B15 of linearization table 1	999.9		
33	tL.b16 [1]	Y-axis point B16 of linearization table 1	999.9		
34	cAIn.1 [1]	Connection number of linearization table 1	0		0: not connected 1: connected to linearization table 1 2: connected to linearization table 2 3: connected to linearization table 3 Description: This setting not available on the SDC40B. Setting 1 has the same effect as setting 0. The linearization table is not connected when the AO1 of the connected destination is smaller than the connected source's final effective point.
35	tL.A01 [2]	X-axis point A01 of linearization table 2	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16. Linearization that excludes the point of deviation is performed when the small-to-large relationship does not follow the number order.
36	tL.A02 [2]	X-axis point A02 of linearization table 2	999.9		
37	tL.A03 [2]	X-axis point A03 o linearization table 2	999.9		
38	tL.A04 [2]	X-axis point A04 of linearization table 2	999.9		
39	tL.A05 [2]	X-axis point A05 of linearization table 2	999.9		
40	tL.A06 [2]	X-axis point A06 of linearization table 2	999.9		
41	tL.A07 [2]	X-axis point A07 of linearization table 2	999.9		
42	tL.A08 [2]	X-axis point A08 of linearization table 2	999.9		
43	tL.A09 [2]	X-axis point A09 of linearization table 2	999.9		
44	tL.A10 [2]	X-axis point A10 of linearization table 2	999.9		
45	tL.A11 [2]	X-axis point A11 of linearization table 2	999.9		
46	tL.A12 [2]	X-axis point A12 of linearization table 2	999.9		
47	tL.A13 [2]	X-axis point A13 of linearization table 2	999.9		
48	tL.A14 [2]	X-axis point A14 of linearization table 2	999.9		
49	tL.A15 [2]	X-axis point A15 of linearization table 2	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
50	tL.A16 [2]	X-axis point A16 of linearization table 2	999.9		
51	[2]	Unused	—		When [----] is displayed, settings cannot be made.
52	tL.b01 [2]	Y-axis point B01 of linearization table 2	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
53	tL.b02 [2]	Y-axis point B02 of linearization table 2	999.9		
54	tL.b03 [2]	Y-axis point B03 of linearization table 2	999.9		
55	tL.b04 [2]	Y-axis point B04 of linearization table 2	999.9		
56	tL.b05 [2]	Y-axis point B05 of linearization table 2	999.9		
57	tL.b06 [2]	-axis point B06 of linearization table 2	999.9		
58	tL.b07 [2]	Y-axis point B07 of linearization table 2	999.9		
59	tL.b08 [2]	Y-axis point B08 of linearization table 2	999.9		
60	tL.b09 [2]	Y-axis point B09 of linearization table 2	999.9		
61	tL.b10 [2]	Y-axis point B10 of linearization table 2	999.9		
62	tL.b11 [2]	Y-axis point B11 of linearization table 2	999.9		
63	tL.b12 [2]	Y-axis point B12 of linearization table 2	999.9		
64	tL.b13 [2]	Y-axis point B13 of linearization table 2	999.9		
65	tL.b14 [2]	Y-axis point B14 of linearization table 2	999.9		
66	tL.b15 [2]	Y-axis point B15 of linearization table 2	999.9		
67	tL.b16 [2]	Y-axis point B16 of linearization table 2	999.9		
68	cAI n.2 [2]	Connection number of linearization table 2	0		0: not connected 1: connected to linearization table 1 2: connected to linearization table 2 3: connected to linearization table 3 Description: This setting not available on the SDC40B. Setting 2 has the same effect as setting 0. The linearization table is not connected when the AO1 of the connected destination is smaller than the connected source's final effective point.
69	tL.A01 [3]	X-axis point A01 of linearization table 3	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). et the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16. Linearization that excludes the point of deviation is performed when the small-to-large relationship does not follow the number order.
70	tL.A02 [3]	X-axis point A02 of linearization table 3	999.9		
71	tL.A03 [3]	X-axis point A03 of linearization table 3	999.9		
72	tL.A04 [3]	X-axis point A04 of linearization table 3	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
73	tL.A05 [3]	X-axis point A05 of linearization table 3	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16 Linearization that excludes the point of deviation is performed when the small-to-large relationship does not follow the number order.
74	tL.A06 [3]	X-axis point A06 of linearization table 3	999.9		
75	tL.A07 [3]	X-axis point A07 of linearization table 3	999.9		
76	tL.A08 [3]	X-axis point A08 of linearization table 3	999.9		
77	tL.A09 [3]	X-axis point A09 of linearization table 3	999.9		
78	tL.A10 [3]	X-axis point A10 of linearization table 3	999.9		
79	tL.A11 [3]	X-axis point A11 of linearization table 3	999.9		
80	tL.A12 [3]	X-axis point A12 of linearization table 3	999.9		
81	tL.A13 [3]	X-axis point A13 of linearization table 3	999.9		
82	tL.A14 [3]	X-axis point A14 of linearization table 3	999.9		
83	tL.A15 [3]	X-axis point A15 of linearization table 3	999.9		
84	tL.A16 [3]	X-axis point A16 of linearization table 3	999.9		
85	[3]	Unused	—		When [----] is displayed, settings cannot be made.
86	tL.b01 [3]	Y-axis point B01 of linearization table 3	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
87	tL.b02 [3]	Y-axis point B02 of linearization table 3	999.9		
88	tL.b03 [3]	Y-axis point B03 of linearization table 3	999.9		
89	tL.b04 [3]	Y-axis point B04 of linearization table 3	999.9		
90	tL.b05 [3]	Y-axis point B05 of linearization table 3	999.9		
91	tL.b06 [3]	Y-axis point B06 of linearization table 3	999.9		
92	tL.b07 [3]	Y-axis point B07 of linearization table 3	999.9		
93	tL.b08 [3]	Y-axis point B08 of linearization table 3	999.9		
94	tL.b09 [3]	Y-axis point B09 of linearization table 3	999.9		
95	tL.b10 [3]	Y-axis point B10 of linearization table 3	999.9		
96	tL.b11 [3]	Y-axis point B11 of linearization table 3	999.9		
97	tL.b12 [3]	Y-axis point B12 of linearization table 3	999.9		
98	tL.b13 [3]	Y-axis point B13 of linearization table 3	999.9		

No.	Item code [aux. display]	Item	factory default settings	User settings	Settings and descriptions
99	tL.b14 [3]	Y-axis point B14 of linearization table 3	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
100	tL.b15 [3]	Y-axis point B15 of linearization table 3	999.9		
101	tL.b16 [3]	Y-axis point B16 of linearization table 3	999.9		
102	cAI n.3 [3]	Connection number of linearization table 3	0		0: not connected 1: connected to linearization table 1 2: connected to linearization table 2 3: connected to linearization table 3 Description: This setting not available on the SDC40B. Setting 3 has the same effect as setting 0. The linearization table is not connected when the AO1 of the connected destination is smaller than the connected source's final effective point.

■ PTB table data settings [Pt b]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	Pt.A01 [1]	X-axis point A01 of PTB table 1	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
2	Pt.A02 [1]	X-axis point A02 of PTB table 1	999.9		
3	Pt.A03 [1]	X-axis point A03 of PTB table 1	999.9		
4	Pt.A04 [1]	X-axis point A04 of PTB table 1	999.9		
5	Pt.A05 [1]	X-axis point A05 of PTB table 1	999.9		
6	Pt.A06 [1]	X-axis point A06 of PTB table 1	999.9		
7	Pt.A07 [1]	X-axis point A07 of PTB table 1	999.9		
8	Pt.A08 [1]	X-axis point A08 of PTB table 1	999.9		
9	Pt.A09 [1]	X-axis point A09 of PTB table 1	999.9		
10	Pt.A10 [1]	X-axis point A10 of PTB table 1	999.9		
11	Pt.A11 [1]	X-axis point A11 of PTB table 1	999.9		
12	Pt.A12 [1]	X-axis point A12 of PTB table 1	999.9		
13	Pt.A13 [1]	X-axis point A13 of PTB table 1	999.9		
14	Pt.A14 [1]	X-axis point A14 of PTB table 1	999.9		
15	Pt.A15 [1]	X-axis point A15 of PTB table 1	999.9		
16	Pt.A16 [1]	X-axis point A16 of PTB table 1	999.9		
17	Pt.b01 [1]	Y-axis point B01 of PTB table 1	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
18	Pt.b02 [1]	Y-axis point B02 of PTB table 1	999.9		
19	Pt.b03 [1]	Y-axis point B03 of PTB table 1	999.9		
20	Pt.b04 [1]	Y-axis point B04 of PTB table 1	999.9		
21	Pt.b05 [1]	Y-axis point B05 of PTB table 1	999.9		
22	Pt.b06 [1]	Y-axis point B06 of PTB table 1	999.9		
23	Pt.b07 [1]	Y-axis point B07 of PTB table 1	999.9		
24	Pt.b08 [1]	Y-axis point B08 of PTB table 1	999.9		
25	Pt.b09 [1]	Y-axis point B0 of PTB table 1	999.9		
26	Pt.b10 [1]	Y-axis point B10 of PTB table 1	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
27	Pt.b11 [1]	Y-axis point B11 of PTB table 1	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
28	Pt.b12 [1]	Y-axis point B12 of PTB table 1	999.9		
29	Pt.b13 [1]	Y-axis point B13 of PTB table 1	999.9		
30	Pt.b14 [1]	Y-axis point B14 of PTB table 1	999.9		
31	Pt.b15 [1]	Y-axis point B15 of PTB table 1	999.9		
32	Pt.b16 [1]	Y-axis point B16 of PTB table 1	999.9		
33	Pt.A01 [2]	X-axis point A01 of PTB table 2	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
34	Pt.A02 [2]	X-axis point A02 of PTB table 2	999.9		
35	Pt.A03 [2]	X-axis point A03 of PTB table 2	999.9		
36	Pt.A04 [2]	X-axis point A04 of PTB table 2	999.9		
37	Pt.A05 [2]	X-axis point A05 of PTB table 2	999.9		
38	Pt.A06 [2]	X-axis point A06 of PTB table 2	999.9		
39	Pt.A07 [2]	X-axis point A07 of PTB table 2	999.9		
40	Pt.A08 [2]	X-axis point A08 of PTB table 2	999.9		
41	Pt.A09 [2]	X-axis point A09 of PTB table 2	999.9		
42	Pt.A10 [2]	X-axis point A10 of PTB table 2	999.9		
43	Pt.A11 [2]	X-axis point A11 of PTB table 2	999.9		
44	Pt.A12 [2]	X-axis point A12 of PTB table 2	999.9		
45	Pt.A13 [2]	X-axis point A13 of PTB table 2	999.9		
46	Pt.A14 [2]	X-axis point A14 of PTB table 2	999.9		
47	Pt.A15 [2]	X-axis point A15 of PTB table 2	999.9		
48	Pt.A16 [2]	X-axis point A16 of PTB table 2	999.9		
49	Pt.b01 [2]	Y-axis point B01 of PTB table 2	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
50	Pt.b02 [2]	Y-axis point B02 of PTB table 2	999.9		
51	Pt.b03 [2]	Y-axis point B03 of PTB table 2	999.9		
52	Pt.b04 [2]	Y-axis point B04 of PTB table 2	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
53	Pt.b05 [2]	Y-axis point B05 of PTB table 2	999.9		-999.9 to + 999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
54	Pt.b06 [2]	Y-axis point B06 of PTB table 2	999.9		
55	Pt.b07 [2]	Y-axis point B07 of PTB table 2	999.9		
56	Pt.b08 [2]	Y-axis point B08 of PTB table 2	999.9		
57	Pt.b09 [2]	Y-axis point B09 of PTB table 2	999.9		
58	Pt.b10 [2]	Y-axis point B10 of PTB table 2	999.9		
59	Pt.b11 [2]	Y-axis point B11 of PTB table 2	999.9		
60	Pt.b12 [2]	Y-axis point B12 of PTB table 2	999.9		
61	Pt.b13 [2]	Y-axis point B13 of PTB table 2	999.9		
62	Pt.b14 [2]	Y-axis point B14 of PTB table 2	999.9		
63	Pt.b15 [2]	Y-axis point B15 of PTB table 2	999.9		
64	Pt.b16 [2]	Y-axis point B16 of PTB table 2	999.9		
65	Pt.A01 [3]	X-axis point A01 of PTB table 3	−999.9		-999.9 to + 999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
66	Pt.A02 [3]	X-axis point A02 of PTB table 3	999.9		
67	Pt.A03 [3]	X-axis point A03 of PTB table 3	999.9		
68	Pt.A04 [3]	X-axis point A04 of PTB table 3	999.9		
69	Pt.A05 [3]	X-axis point A05 of PTB table 3	999.9		
70	Pt.A06 [3]	X-axis point A06 of PTB table 3	999.9		
71	Pt.A07 [3]	X-axis point A07 of PTB table 3	999.9		
72	Pt.A08 [3]	X-axis point A08 of PTB table 3	999.9		
73	Pt.A09 [3]	X-axis point A09 of PTB table 3	999.9		
74	Pt.A10 [3]	X-axis point A10 of PTB table 3	999.9		
75	Pt.A11 [3]	X-axis point A11 of PTB table 3	999.9		
76	Pt.A12 [3]	X-axis point A12 of PTB table 3	999.9		
77	Pt.A13 [3]	X-axis point A13 of PTB table 3	999.9		
78	Pt.A14 [3]	X-axis point A14 of PTB table 3	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
79	Pt.A15 [3]	X-axis point A15 of PTB table 3	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
80	Pt.A16 [3]	X-axis point A16 of PTB table 3	999.9		
81	Pt.b01 [3]	Y-axis point B01 of PTB table 3	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
82	Pt.b02 [3]	Y-axis point B02 of PTB table 3	999.9		
83	Pt.b03 [3]	Y-axis point B03 of PTB table 3	999.9		
84	Pt.b04 [3]	Y-axis point B04 of PTB table 3	999.9		
85	Pt.b05 [3]	Y-axis point B05 of PTB table 3	999.9		
86	Pt.b06 [3]	Y-axis point B06 of PTB table 3	999.9		
87	Pt.b07 [3]	Y-axis point B07 of PTB table 3	999.9		
88	Pt.b08 [3]	Y-axis point B08 of PTB table 3	999.9		
89	Pt.b09 [3]	Y-axis point B09 of PTB table 3	999.9		
90	Pt.b10 [3]	Y-axis point B10 of PTB table 3	999.9		
91	Pt.b11 [3]	Y-axis point B11 of PTB table 3	999.9		
92	Pt.b12 [3]	Y-axis point B12 of PTB table 3	999.9		
93	Pt.b13 [3]	Y-axis point B13 of PTB table 3	999.9		
94	Pt.b14 [3]	Y-axis point B14 of PTB table 3	999.9		
95	Pt.b15 [3]	Y-axis point B15 of PTB table 3	999.9		
96	Pt.b16 [3]	Y-axis point B16 of PTB table 3	999.9		
97	Pt.A01 [4]	X-axis point A01 of PTB table 4	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
98	Pt.A02 [4]	X-axis point A02 of PTB table 4	999.9		
99	Pt.A03 [4]	X-axis point A03 of PTB table 4	999.9		
100	Pt.A04 [4]	X-axis point A04 of PTB table 4	999.9		
101	Pt.A05 [4]	X-axis point A05 of PTB table 4	999.9		
102	Pt.A06 [4]	X-axis point A06 of PTB table 4	999.9		
103	Pt.A07 [4]	X-axis point A07 of PTB table 4	999.9		
104	Pt.A08 [4]	X-axis point A08 of PTB table 4	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
105	Pt.A09 [4]	X-axis point A09 of PTB table 4	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ⋯ ≦ A15 ≦ A16.
106	Pt.A10 [4]	X-axis point A10 of PTB table 4	999.9		
107	Pt.A11 [4]	X-axis point A11 of PTB table 4	999.9		
108	Pt.A12 [4]	X-axis point A12 of PTB table 4	999.9		
109	Pt.A13 [4]	X-axis point A13 of PTB table 4	999.9		
110	Pt.A14 [4]	X-axis point A14 of PTB table 4	999.9		
111	Pt.A15 [4]	X-axis point A15 of PTB table 4	999.9		
112	Pt.A16 [4]	X-axis point A16 of PTB table 4	999.9		
113	Pt.b01 [4]	Y-axis point B01 of PTB table 4	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
114	Pt.b02 [4]	Y-axis point B02 of PTB table 4	999.9		
115	Pt.b03 [4]	Y-axis point B03 of PTB table 4	999.9		
116	Pt.b04 [4]	Y-axis point B04 of PTB table 4	999.9		
117	Pt.b05 [4]	Y-axis point B05 of PTB table 4	999.9		
118	Pt.b06 [4]	Y-axis point B06 of PTB table 4	999.9		
119	Pt.b07 [4]	Y-axis point B07 of PTB table 4	999.9		
120	Pt.b08 [4]	Y-axis point B08 of PTB table 4	999.9		
121	Pt.b09 [4]	Y-axis point B09 of PTB table 4	999.9		
122	Pt.b10 [4]	Y-axis point B10 of PTB table 4	999.9		
123	Pt.b11 [4]	Y-axis point B11 of PTB table 4	999.9		
124	Pt.b12 [4]	Y-axis point B12 of PTB table 4	999.9		
125	Pt.b13 [4]	Y-axis point B13 of PTB table 4	999.9		
126	Pt.b14 [4]	Y-axis point B14 of PTB table 4	999.9		
127	Pt.b15 [4]	Y-axis point B15 of PTB table 4	999.9		
128	Pt.b16 [4]	Y-axis point B16 of PTB table 4	999.9		

■ TTB table data settings [ttb]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	tt.A01 [1]	X-axis point A01 of TTB table 1	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
2	tt.A02 [1]	X-axis point A02 of TTB table 1	999.9		
3	tt.A03 [1]	X-axis point A03 of TTB table 1	999.9		
4	tt.A04 [1]	X-axis point A04 of TTB table 1	999.9		
5	tt.A05 [1]	X-axis point A05 of TTB table 1	999.9		
6	tt.A06 [1]	X-axis point A06 of TTB table 1	999.9		
7	tt.A07 [1]	X-axis point A07 of TTB table 1	999.9		
8	tt.A08 [1]	X-axis point A08 of TTB table 1	999.9		
9	tt.A09 [1]	X-axis point A09 of TTB table 1	999.9		
10	tt.A10 [1]	X-axis point A10 of TTB table 1	999.9		
11	tt.A11 [1]	X-axis point A11 of TTB table 1	999.9		
12	tt.A12 [1]	X-axis point A12 of TTB table 1	999.9		
13	tt.A13 [1]	X-axis point A13 of TTB table 1	999.9		
14	tt.A14 [1]	X-axis point A14 of TTB table 1	999.9		
15	tt.A15 [1]	X-axis point A15 of TTB table 1	999.9		
16	tt.A16 [1]	X-axis point A16 of TTB table 1	999.9		
17	tt.b01 [1]	Y-axis point B01 of TTB table 1	0.0		0.0 to 6000.0s Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
18	tt.b02 [1]	Y-axis point B02 of TTB table 1	6000.0		
19	tt.b03 [1]	Y-axis point B03 of TTB table 1	6000.0		
20	tt.b04 [1]	Y-axis point B04 of TTB table 1	6000.0		
21	tt.b05 [1]	Y-axis point B05 of TTB table 1	6000.0		
22	tt.b06 [1]	Y-axis point B06 of TTB table 1	6000.0		
23	tt.b07 [1]	Y-axis point B07 of TTB table 1	6000.0		
24	tt.b08 [1]	Y-axis point B08 of TTB table 1	6000.0		
25	tt.b09 [1]	Y-axis point B09 of TTB table 1	6000.0		
26	tt.b10 [1]	Y-axis point B10 of TTB table 1	6000.0		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
27	tt.b11 [1]	Y-axis point B11 of TTB table 1	6000.0		0.0 to 6000.0s Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
28	tt.b12 [1]	Y-axis point B12 of TTB table 1	6000.0		
29	tt.b13 [1]	Y-axis point B13 of TTB table 1	6000.0		
30	tt.b14 [1]	Y-axis point B14 of TTB table 1	6000.0		
31	tt.b15 [1]	Y-axis point B15 of TTB table 1	6000.0		
32	tt.b16 [1]	Y-axis point B16 of TTB table 1	6000.0		
33	tt.A01 [2]	X-axis point A0 of TTB table 2	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
34	tt.A02 [2]	X-axis point A02 of TTB table 2	999.9		
35	tt.A03 [2]	X-axis point A03 of TTB table 2	999.9		
36	tt.A04 [2]	X-axis point A04 of TTB table 2	999.9		
37	tt.A05 [2]	X-axis point A05 of TTB table 2	999.9		
38	tt.A06 [2]	X-axis point A06 of TTB table 2	999.9		
39	tt.A07 [2]	X-axis point A07 of TTB table 2	999.9		
40	tt.A08 [2]	X-axis point A08 of TTB table 2	999.9		
41	tt.A09 [2]	X-axis point A09 of TTB table 2	999.9		
42	tt.A10 [2]	X-axis point A10 of TTB table 2	999.9		
43	tt.A11 [2]	X-axis point A11 of TTB table 2	999.9		
44	tt.A12 [2]	X-axis point A12 of TTB table 2	999.9		
45	tt.A13 [2]	X-axis point A13 of TTB table 2	999.9		
46	tt.A14 [2]	X-axis point A14 of TTB table 2	999.9		
47	tt.A15 [2]	X-axis point A15 of TTB table 2	999.9		
48	tt.A16 [2]	X-axis point A16 of TTB table 2	999.9		
49	tt.b01 [2]	Y-axis point B01 of TTB table 2	0.0		0.0 to 6000.0s Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
50	tt.b02 [2]	Y-axis point B02 of TTB table 2	6000.0		
51	tt.b03 [2]	Y-axis point B03 of TTB table 2	6000.0		
52	tt.b04 [2]	Y-axis point B04 of TTB table 2	6000.0		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
53	tt.b05 [2]	Y-axis point B05 of TTB table 2	6000.0		0.0 to 6000.0s Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
54	tt.b06 [2]	Y-axis point B06 of TTB table 2	6000.0		
55	tt.b07 [2]	Y-axis point B07 of TTB table 2	6000.0		
56	tt.b08 [2]	Y-axis point B08 of TTB table 2	6000.0		
57	tt.b09 [2]	Y-axis point B09 of TTB table 2	6000.0		
58	tt.b10 [2]	Y-axis point B10 of TTB table 2	6000.0		
59	tt.b11 [2]	Y-axis point B11 of TTB table 2	6000.0		
60	tt.b12 [2]	Y-axis point B12 of TTB table 2	6000.0		
61	tt.b13 [2]	Y-axis point B13 of TTB table 2	6000.0		
62	tt.b14 [2]	Y-axis point B14 of TTB table 2	6000.0		
63	tt.b15 [2]	Y-axis point B15 of TTB table 2	6000.0		
64	tt.b16 [2]	Y-axis point B16 of TTB table 2	6000.0		
65	tt.A01 [3]	X-axis point A01 of TTB table 3	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
66	tt.A02 [3]	X-axis point A02 of TTB table 3	999.9		
67	tt.A03 [3]	X-axis point A03 of TTB table 3	999.9		
68	tt.A04 [3]	X-axis point A04 of TTB table 3	999.9		
69	tt.A05 [3]	X-axis point A05 of TTB table 3	999.9		
70	tt.A06 [3]	X-axis point A06 of TTB table 3	999.9		
71	tt.A07 [3]	X-axis point A07 of TTB table 3	999.9		
72	tt.A08 [3]	X-axis point A08 of TTB table 3	999.9		
73	tt.A09 [3]	X-axis point A09 of TTB table 3	999.9		
74	tt.A10 [3]	X-axis point A10 of TTB table 3	999.9		
75	tt.A11 [3]	X-axis point A11 of TTB table 3	999.9		
76	tt.A12 [3]	X-axis point A12 of TTB table 3	999.9		
77	tt.A13 [3]	X-axis point A13 of TTB table 3	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
78	tt.A14 [3]	X-axis point A14 of TTB table 3	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
79	tt.A15 [3]	X-axis point A15 of TTB table 3	999.9		
80	tt.A16 [3]	X-axis point A16 of TTB table 3	999.9		
81	tt.b01 [3]	Y-axis point B01 of TTB table 3	0.0		0.0 to 6000.0s Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
82	tt.b02 [3]	Y-axis point B02 of TTB table 3	6000.0		
83	tt.b03 [3]	Y-axis point B03 of TTB table 3	6000.0		
84	tt.b04 [3]	Y-axis point B04 of TTB table 3	6000.0		
85	tt.b05 [3]	Y-axis point B05 of TTB table 3	6000.0		
86	tt.b06 [3]	Y-axis point B06 of TTB table 3	6000.0		
87	tt.b07 [3]	Y-axis point B07 of TTB table 3	6000.0		
88	tt.b08 [3]	Y-axis point B08 of TTB table 3	6000.0		
89	tt.b09 [3]	Y-axis point B09 of TTB table 3	6000.0		
90	tt.b10 [3]	Y-axis point B10 of TTB table 3	6000.0		
91	tt.b11 [3]	Y-axis point B11 of TTB table 3	6000.0		
92	tt.b12 [3]	Y-axis point B12 of TTB table 3	6000.0		
93	tt.b13 [3]	Y-axis point B13 of TTB table 3	6000.0		
94	tt.b14 [3]	Y-axis point B14 of TTB table 3	6000.0		
95	tt.b15 [3]	Y-axis point B15 of TTB table 3	6000.0		
96	tt.b16 [3]	Y-axis point B16 of TTB table 3	6000.0		
97	tt.A01 [4]	X-axis point A01 of TTB table 4	−999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1 ≦ AO2 ≦ ··· ≦ A15 ≦ A16.
98	tt.A02 [4]	X-axis point A02 of TTB table 4	999.9		
99	tt.A03 [4]	X-axis point A03 of TTB table 4	999.9		
100	tt.A04 [4]	X-axis point A04 of TTB table 4	999.9		
101	tt.A05 [4]	X-axis point A05 of TTB table 4	999.9		
102	tt.A06 [4]	X-axis point A06 of TTB table 4	999.9		
103	tt.A07 [4]	X-axis point A07 of TTB table 4	999.9		

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
104	tt.A08 [Y]	X-axis point A08 of TTB table 4	999.9		-999.9 to +999.9% Description: Indicates that item An is input (X axis) and item Bn is output (Y axis). Set the values so that AO1≦ AO2≦ ··· ≦ A15≦ A16.
105	tt.A09 [Y]	X-axis point A09 of TTB table 4	999.9		
106	tt.A10 [Y]	X-axis point A10 of TTB table 4	999.9		
107	tt.A11 [Y]	X-axis point A11 of TTB table 4	999.9		
108	tt.A12 [Y]	X-axis point A12 of TTB table 4	999.9		
109	tt.A13 [Y]	X-axis point A13 of TTB table 4	999.9		
110	tt.A14 [Y]	X-axis point A14 of TTB table 4	999.9		
111	tt.A15 [Y]	X-axis point A15 of TTB table 4	999.9		
112	tt.A16 [Y]	X-axis point A16 of TTB table 4	999.9		
113	tt.b01 [Y]	Y-axis point B01 of TTB table 4	0.0		0.0 to 6000.0s Description: Indicates that item An is input (X axis) and item Bn is output (Y axis).
114	tt.b02 [Y]	Y-axis point B02 of TTB table 4	6000.0		
115	tt.b03 [Y]	Y-axis point B03 of TTB table 4	6000.0		
116	tt.b04 [Y]	Y-axis point B04 of TTB table 4	6000.0		
117	tt.b05 [Y]	Y-axis point B05 of TTB table 4	6000.0		
118	tt.b06 [Y]	Y-axis point B06 of TTB table 4	6000.0		
119	tt.b07 [Y]	Y-axis point B07 of TTB table 4	6000.0		
120	tt.b08 [Y]	Y-axis point B08 of TTB table 4	6000.0		
121	tt.b09 [Y]	Y-axis point B09 of TTB table 4	6000.0		
122	tt.b10 [Y]	Y-axis point B10 of TTB table 4	6000.0		
123	tt.b11 [Y]	Y-axis point B11 of TTB table 4	6000.0		
124	tt.b12 [Y]	Y-axis point B12 of TTB table 4	6000.0		
125	tt.b13 [Y]	Y-axis point B13 of TTB table 4	6000.0		
126	tt.b14 [Y]	Y-axis point B14 of TTB table 4	6000.0		
127	tt.b15 [Y]	Y-axis point B15 of TTB table 4	6000.0		
128	tt.b16 [Y]	Y-axis point B16 of TTB table 4	6000.0		

■ Variableariable parameter (percentage format) settings [P.PAr A]

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	PPA01	Variable parameter (% format) 1	0.0		-999.9 to +999.9%
2	PPA02	Variable parameter (% format) 2	0.0		
3	PPA03	Variable parameter (% format) 3	0.0		
4	PPA04	Variable parameter (% format) 4	0.0		
5	PPA05	Variable parameter (% format) 5	0.0		
6	PPA06	Variable parameter (% format) 6	0.0		
7	PPA07	Variable parameter (% format) 7	0.0		
8	PPA08	Variable parameter (% format) 8	0.0		
9	PPA09	Variable parameter (% format) 9	0.0		
10	PPA10	Variable parameter (% format) 10	0.0		
11	PPA11	Variable parameter (% format) 11	0.0		
12	PPA12	Variable parameter (% format) 12	0.0		
13	PPA13	Variable parameter (% format) 13	0.0		
14	PPA14	Variable parameter (% format) 14	0.0		
15	PPA15	Variable parameter (% format) 15	0.0		
16	PPA16	Variable parameter (% format) 16	0.0		
17	PPA17	Variable parameter (% format) 17	0.0		
18	PPA18	Variable parameter (% format) 18	0.0		
19	PPA19	Variable parameter (% format) 19	0.0		
20	PPA20	Variable parameter (% format) 20	0.0		
21	PPA21	Variable parameter (% format) 21	0.0		
22	PPA22	Variable parameter (% format) 22	0.0		
23	PPA23	Variable parameter (% format) 23	0.0		
24	PPA24	Variable parameter (% format) 24	0.0		
25	PPA25	Variable parameter (% format) 25	0.0		
26	PPA26	Variable parameter (% format) 26	0.0		
27	PPA27	Variable parameter (% format) 27	0.0		
28	PPA28	Variable parameter (% format) 28	0.0		
29	PPA29	Variable parameter (% format) 29	0.0		
30	PPA30	Variable parameter (% format) 30	0.0		
31	PPA31	Variable parameter (% format) 31	0.0		
32	PPA32	Variable parameter (% format) 32	0.0		
33	PPA33	Variable parameter (% format) 33	0.0		
34	PPA34	Variable parameter (% format) 34	0.0		
35	PPA35	Variable parameter (% format) 35	0.0		
36	PPA36	Variable parameter (% format) 36	0.0		
37	PPA37	Variable parameter (% format) 37	0.0		
38	PPA38	Variable parameter (% format) 38	0.0		
39	PPA39	Variable parameter (% format) 39	0.0		
40	PPA40	Variable parameter (% format) 40	0.0		

■ Variable parameter (time format) settings [t.PAr A]

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	t PA01	Variable parameter (time format) 1	0.0		0.0 to 6000.0s
2	t PA02	Variable parameter (time format) 2	0.0		
3	t PA03	Variable parameter (time format) 3	0.0		
4	t PA04	Variable parameter (time format) 4	0.0		
5	t PA05	Variable parameter (time format) 5	0.0		
6	t PA06	Variable parameter (time format) 6	0.0		
7	t PA07	Variable parameter (time format) 7	0.0		
8	t PA08	Variable parameter (time format) 8	0.0		
9	t PA09	Variable parameter (time format) 9	0.0		
10	t PA10	Variable parameter (time format)10	0.0		

■ Variable parameter (flag format) settings [F.PAr A]

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	FPA01	Variable parameter (flag format) 1	0		0 : OFF 1 : ON
2	FPA02	Variable parameter (flag format) 2	0		
3	FPA03	Variable parameter (flag format) 3	0		
4	FPA04	Variable parameter (flag format) 4	0		
5	FPA05	Variable parameter (flag format) 5	0		
6	FPA06	Variable parameter (flag format) 6	0		
7	FPA07	Variable parameter (flag format) 7	0		
8	FPA08	Variable parameter (flag format) 8	0		
9	FPA09	Variable parameter (flag format) 9	0		
10	FPA10	Variable parameter (flag format) 10	0		
11	FPA11	Variable parameter (flag format) 11	0		
12	FPA12	Variable parameter (flag format) 12	0		
13	FPA13	Variable parameter (flag format) 13	0		
14	FPA14	Variable parameter (flag format) 14	0		
15	FPA15	Variable parameter (flag format) 15	0		
16	FPA16	Variable parameter (flag format) 16	0		
17	FPA17	Variable parameter (flag format) 17	0		
18	FPA18	Variable parameter (flag format) 18	0		
19	FPA19	Variable parameter (flag format) 19	0		
20	FPA20	Variable parameter (flag format) 20	0		

■ Variable parameter (index format) settings [I .PAr A]

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	I PA01	Variable parameter (index format) 1	0		0 to 30000
2	I PA02	Variable parameter (index format) 2	0		
3	I PA03	Variable parameter (index format) 3	0		
4	I PA04	Variable parameter (index format) 4	0		
5	I PA05	Variable parameter (index format) 5	0		
6	I PA06	Variable parameter (index format) 6	0		
7	I PA07	Variable parameter (index format) 7	0		
8	I PA08	Variable parameter (index format) 8	0		
9	I PA09	Variable parameter (index format) 9	0		
10	I PA10	Variable parameter (index format) 10	0		

■ Engineering unit parameter settings [E.PAr-A]

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	EP1-0	Engineering unit parameter 1-0	0U		Engineering unit lower limit to upper limit (in relation to PID1 computational unit) Description: The setting range is determined by the engineering unit upper and lower limits of the input number specified by engineering unit setting "1" in [control computational data]. This means they are appropriate for use with PID1 unit parameters. Settings are designed so that when the decimal point positions and the upper limits and lower limits of engineering unit values in [input processing data] change, they are the same as percent data.
2	EP1-1	Engineering unit parameter 1-1	0U		
3	EP1-2	Engineering unit parameter 1-2	0U		
4	EP1-3	Engineering unit parameter 1-3	0U		
5	EP1-4	Engineering unit parameter 1-4	0U		
6	EP1-5	Engineering unit parameter 1-5	0U		
7	EP1-6	Engineering unit parameter 1-6	0U		
8	EP1-7	Engineering unit parameter 1-7	0U		
9	EP2-0	Engineering unit parameter 2-0	0U		Engineering unit lower limit to upper limit (in relation to PID2 computational unit) Description: The setting range is determined by the engineering unit upper and lower limits of the input number specified by engineering unit setting "2" in [control computational data]. This means they are appropriate for use with PID2 computational unit parameters. Settings are designed so that when the decimal point positions, upper limits and lower limits of engineering unit values in [input processing data] change, they are the same as percent data.
10	EP2-1	Engineering unit parameter 2-1	0U		
11	EP2-2	Engineering unit parameter 2-2	0U		
12	EP2-3	Engineering unit parameter 2-3	0U		
13	EP2-4	Engineering unit parameter 2-4	0U		
14	EP2-5	Engineering unit parameter 2-5	0U		
15	EP2-6	Engineering unit parameter 2-6	0U		
16	EP2-7	Engineering unit parameter 2-7	0U		

■ UF key processing data settings [UF]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	UF.SEt [1]	UF1 key basic registration	0		0 : assigned as setting items 1 : used as user switch Description: This setting not available on the SDC40B. When set to "0", UF1 key cannot be used as the internal user switch signal for computation processing.
2	UF-01 [1]	UF1 key assignment item 1	600		600 to 4000 Description: When the UF1 key's basic registration is set to "1", [----] is displayed and setting cannot be performed. Settings are made using the sum of the following fixed settings numbers and the number (No.) of the item to be assigned. Assignment is invalid when non-existent item numbers are entered. Computational unit monitor : 600 Input/output signal monitor : 1000 Setup data : 2000 Input processing data : 2100 Control computational data : 2200 PID parameter : 2300 Linearization data : 2500 PTB table data : 2700 TTB table data : 2900 Variable parameter (percentage format) : 3100 Variable parameter (time format) : 3200 Variable parameter (flag format) : 3300 Variable parameter (index format) : 3400 Engineering unit parameter : 3500 UF key processing data : 3600 Digital input processing data : 3700 ID data : 3800 Protect : 3900
3	UF-02 [1]	UF1 key assignment item 2	600		
4	UF-03 [1]	UF1 key assignment item 3	600		
5	UF-04 [1]	UF1 key assignment item 4	600		
6	UF-05 [1]	UF1 key assignment item 5	600		
7	UF-06 [1]	UF1 key assignment item 6	600		
8	UF-07 [1]	UF1 key assignment item 7	600		
9	UF-08 [1]	UF1 key assignment item 8	600		
10	UF.SEt [2]	UF2 key basic registration	0		0 : assigned as setting items 1 : used as user switch Description: This setting not available on the SDC40B. When set to "0", UF1 key cannot be used as the internal user switch signal for computation processing.
11	UF-01 [2]	UF2 key assignment item 1	600		600 to 4000 Description: When the UF2 key's basic registration is set to "1", [----] is displayed and setting cannot be performed. Settings are made using the sum of the following fixed settings numbers and the number (No.) of the item to be assigned. Assignment is invalid when non-existent item numbers are entered.
12	UF-02 [2]	UF2 key assignment item 2	600		
13	UF-03 [2]	UF2 key assignment item 3	600		
14	UF-04 [2]	UF2 key assignment item 4	600		
15	UF-05 [2]	UF2 key assignment item 5	600		
16	UF-06 [2]	UF2 key assignment item 6	600		
17	UF-07 [2]	UF2 key assignment item 7	600		
18	UF-08 [2]	UF2 key assignment item 8	600		

■ Digital input processing data settings [dI .Fnc]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	dI .toP [1]	Start point of digital input process 1	0		0 : digital input processing used 1 to 12: digital input number Description: This setting not available on the SDC40B.
2	dI .toP [2]	Start point of digital input process 2	0		
3	dI .toP [3]	Start point of digital input process 3	0		
4	dI .toP [4]	Start point of digital input process 4	0		
5	dI .toP [5]	Start point of digital input process 5	0		
6	dI .toP [6]	Start point of digital input process 6	0		
7	dI .nbr [1]	No. of units on digital input process 1	1		1 to (13 − start point setting) Description: When any of the digital input process start points are set to "0", [----] is displayed and setting cannot be performed. The number of computational units that are to perform digital input processing. For example, if set to "3", 23 index data items (0 to 7) can be selected with digital input processing.
8	dI .nbr [2]	No. of units on digital input process 2	1		
9	dI .nbr [3]	No. of units on digital input process 3	1		
10	dI .nbr [4]	No. of units on digital input process 4	1		
11	dI .nbr [5]	No. of units on digital input process 5	1		
12	dI .nbr [6]	No. of units on digital input process 6	1		

■ ID data settings [Id]

No.	Item code	Item	Factory default settings	Settings and descriptions
1	Id-01	Hardware type 1	0C04	Description: Can be viewed but not set.
2	Id-02	Hardware type 2	023F	
3	Id-03	ROM ID	0	
4	Id-04	ROM ITEM	0	
5	Id-05	ROM revision	0	

■ Protect settings [Prtct]

No.	Item code [aux. display]	Item	Factory default settings	User settings	Settings and descriptions
1	SEL [1]	Setting transition selection	0		0 : protect only made available 1 : control computational data, PID parameters, variable parameters, engineering unit parameters and protect made available 2 : linearization table data, PTB table data, TTB table data and protect made available 3 : setup data, input processing data, UF key processing data, digital input processing data, ID data and protect made available 4 : computational unit monitor, input/output signal monitor and protect made available 5 : all items made available
2	Loc [2]	Keylock	00000		00000 to 11111 Description: Binary input sets the keylock. The following keys are set according to digit position. 1st digit : PARA key 2nd digit : CAS key 3rd digit : AUTO key 4th digit : MAN key 5th digit : AT key The following values are used for making digit position settings. 0 : keylock disabled 1 : keylock enabled Even when keylock is set for the PARA key, keylock settings alone can be modified.

■ Computational unit monitor [Unit]

No.	Item code [aux. display]	Item	Settings and descriptions
1	U.tYPE [1]	Computational expression	0 to 99 Description: Can be viewed but not set. Unit number is shown on display panel 3's auxiliary display. A "0" indicates the unit is not in use.
2	U-X1 [1]	H1 input signal	-999.9 to +999.9% (% format) 0.0 to 6000s (time format) Off, On (flag format) 0 to 30000 (index format) Description: Can be viewed but not set. Unit number is shown on display panel 3's auxiliary display. [----] is displayed when either the unit or the connector is unused. Displayed in the format of data being used, except with engineering unit parameters, which are displayed in percentage format.
3	U-X2 [1]	H2 input signal	
4	U-P1 [1]	P1 input signal	
5	U-P2 [1]	P2 input signal	
6	U.oUt [1]	Output signal	
. . . .	. . . .	. . . .	. . . .
295	U.tYPE [50]	Computational expression	0 to 99 Description: Can be viewed but not set. Unit number is shown on display panel 3's auxiliary display. A "0" indicates the unit is not in use.
296	U-X1 [50]	H1 input signa	-999.9 to +999.9% (% format) 0.0 to 6000s (time format) Off, On (flag format) 0 to 30000 (index format) Description: Can be viewed but not set. Unit number is shown on display panel 3's auxiliary display. [----] is displayed when either the unit or the connector is unused. Displayed in the format of data being used, except with engineering unit parameters, which are displayed in percentage format.
297	U-X2 [50]	H2 input signal	
298	U-P1 [50]	P1 input signal	
299	U-P2 [50]	P2 input signal	
300	U.oUt [50]	Output signal	

■ Input/output signal monitor [I o.dAt]

No.	Item code	Item	Settings and descriptions
1	Pv1	PV1	Description: Shown in engineering units. When there is no PID1 computational unit, PV1, RSP1, SP1, DEV1 and MV1 are undefined.
2	rSP1	RSP1	
3	LSP1	LSP1	
4	SP1	SP1	
5	dEv1	DEV1	Description: Shown in engineering units. DEV1 = SP1-PV1
6	M.v1	MV1	-999.9 to +999.9%
7	Pv2	PV2	Description: Shown in engineering units. When there is no PID2 computational unit, PV2, RSP2, SP2, DEV2 and MV2 are undefined.
8	rSP2	RSP2	
9	LSP2	LSP2	
10	SP2	SP2	
11	dEv2	DEV2	Description: Shown in engineering units. DEV2 = SP2-PV2
12	M.v2	MV2	-999.9 to +999.9%
13	AIr-1	Analog input 1(AIR1)	-10.0 to +110.0%
14	AIr-2	Analog input 2 (AIR2)	
15	AIr-3	Analog input 3(AIR3)	
16	AI-1	Analog input 1 (AI1)	Description: Shown in engineering units.
17	AI-2	Analog input 2 (AI2)	
18	AI-3	Analog input 3(AI3)	
19	Ao-1	Analog input 1	-10.0 to +110.0%
20	Ao-2	Analog input 2	
21	Ao-3	Analog input 3	
22	M.Fb	MFB value	-50.0to +150.0%
23	dI.1-4	Digital input signals 1 to 4	0000 to 1111 (binary code) Description: DI1, DI2, DI3 and DI4 are shown on the display digits in order from the right. Each display digit shows decimal point to indicate numbers are not in decimal format.
24	dI.5-8	Digital input signals 5 to 8	0000 to 1111 (binary code) Description: DI5, DI6, DI7 and DI8 are shown on the display digits in order from the right. Each display digit shows decimal point to indicate numbers are not in decimal format.
25	dI.9-C	Digital input ignals 9 to 12	0000 to 1111 (binary code) Description: DI9, DI10, DI11 and DI12 are shown on the display digits in order from the right. Each display digit shows decimal point to indicate numbers are not in decimal format.
26	do.1-4	Digital output signals 1 to 4	0000 to 1111 (binary code) Description: DO1, DO2, DO3 and DO4 are shown on the display digits in order from the right. Each display digit shows decimal point to indicate numbers are not in decimal format.
27	do.5-8	Digital output signals 5 to 8	0000 to 1111 (binary code) Description: DO5, DO6, DO7 and DO8 are shown on the display digits in order from the right. Each display digit shows decimal point to indicate numbers are not in decimal format.

No.	Item code	Item	Setting and descriptions
28	d1.Fc1	Digital input process 1	0 to 4095 (index format)
29	d1.Fc2	Digital input process 2	
30	d1.Fc3	Digital input process 3	
31	d1.Fc4	Digital input process 4	
32	d1.Fc5	Digital input process 5	
33	d1.Fc6	Digital input process 6	

7 - 10 Password Functions

The password functions are to disable the communication (SDC40B loadercommunication) between the controller and a personal computer loader. When the communication is disabled, the configuration data read to the personal computer loader from the controller, the configuration data write to the controller from the personal computer loader and the data trend display by thepersonal computer loader can not be performed. The password functions are functionsadded from ROM revision 8 which can be referred by I d-05 (ROM revision) of ID data.

Handling Precautions Two passwords are used. Please do not forget the passwords but carefully register and file them. In order to cancel the passwords, either entering two passwords correctly or initializing all the configuration data with the general reset must be performed.

■ Setting method of passwords

● Enabling the password setting

Under the factory default settings, the password setting can not be entered.

The password setting mode is possibly established by the following steps:

- Set SEL (transition selection) of the protect to 5.
- Set the right side digit of the protect Loc (key lock) to 0.
- Set C32 (special function) of setup data to 59.

Handling Precautions Regardless of enabling the password setting or not, The SDC40B loader communication is under the disabled state if the passwords are already set up.

● Setting the passwords

There are two passwords. The hexadecimal numbers of 0000 to FFFF can be set for each password. The display of the controller is indicated with 4 digits with all decimal points like 0.0.0.0. to F.F.F.F.

Please set the passwords in accordance with the following procedure:

① Consider of two blocks of hexadecimal numbers to be selected for the passwords, and make the recording by writing them on a sheet of paper.

② Under the normal display mode, press the PARA key several times, and enter the password setting by pressing the ENT key after seeing PASS displayed on the display panel 1.

③ Set the first password to PS-1A (password 1A registration).

④ Set the second password to PS-2A (password 2A registration).

⑤ In order to conceal the passwords, the hexadecimal numbers except that of the first password must be set as PS-1b (password 1B cancellation).

⑥ In order to conceal the passwords, the hexadecimal numbers except that of the second password must be set as PS-2b (password 2B cancellation).

⑦ The registering of two passwords must be filed.

In addition, set C32 (special function) of the setup data to 0 so as to execute non-entry of the password setting.

Handling Precautions

- If either one of the passwords is not correct, the set values of PS-1A and PS-2A become 「----」 display showing no judgment of the correct passwords. Therefore, make sure to set the passwords after registering two passwords correctly.
- The passwords can not be assigned to the setting item of the UF key.
- The passwords can not be displayed and set by the personal computer loader.
- Read and write of the passwords by the CPL communication can not be executed.

■ Canceling method of passwords

● Enabling the password setting

This is the same as the previous description in ■Setting method of passwords.

● Canceling the passwords

The passwords can be canceled in the following procedure:

① Press the PARA key several times under the normal display mode and enter the password setting by pressing the ENT key after PASS is shown on the display panel 1.

② Set the first password to PS-1b (password 1B cancellation).

③ Set the second password to PS-2b (password 2B cancellation).
In addition, in order to prevent the password set execution, set C32 (special function) of the setup data to 0.

Handling Precautions When the passwords are gone and could not be confirmed, the password cancellation can be made by the general reset. In this case, all the configuration data are to be initialized. The operation method of general reset is described in the following item:

■ Password setting [PASS]

No.	Item code	Item	Factory defaut settings	User settings	Settings and Descriptions
1	PS-1A	Password 1A registration	FFFF		In case of 0000 to FFFF [Description] PS-1b becomes the same value if PS-1A is set. In case of PS-1A ≠ PS-1b or PS-2A ≠ PS-2b, 「----」 is displayed and setting is disabled.
2	PS-2A	Password 2A registration	FFFF		0000 to FFF [Description] PS-2b becomes the samevalue if PS-2A is set. In case of PS-1A ≠ PS-1b or PS-2A ≠ PS-2b, 「----」 is displayed and setting is disabled.
3	PS-1b	Password 1B cancellation	FFFF		0000 to FFFF [Description] In case of PS-1A ≠ PS-1b, SDC40B loader communication is disabled.
4	PS-2b	Password 2B cancellation	FFFF		0000 to FFFF [Description] In case of PS-2A ≠ PS-2b, SDC40B loader communication is disabled.

■ Operating method of the general reset

When the passwords are gone and could not be confirmed, the password cancellation can be performed with the general reset. However, if general reset is entered, all the configuration data are initialized.

● Enabling the adjustment set

The general reset operation is performed in the adjustment setting. The adjustment set can not be entered under thefactory default set condition. The adjustment set is enabled by executing the following:

- SEL (transition selection) of the protect is set to 5.
- The last digits on the right side of the protect Loc (keylock)are set to 0.0.0.0.
- Set C32 (special function) of setup data to 130

● Executing the general reset

① Set the normal display mode.
If LSP is flashing under being changed, stop the flashing by pressing the DISP key.

② When keep pressing the ENT key with no blinking status under thenormal display mode and the adjustment set enters with both the PARA key and the ▼ key imultaneously pressed,
the display panel 1 becomes 0.0.0.0, the display panel 2 becomes ADJ and the display panel 3 becomes 0.0.

③ Change the display panel 1 to 9.9.9.9. with use of the ▲ key, ▼ key, ▶ key and ◀ key and conduct the general reset by pressing the ENT key. At this point, the display disappears momentarily and returns to the normal display mode after momentarily indicating 9rEST on the display panel 2. .

Handling Precautions

- Don't press the ENT key with those digits other than 9.9.9.9. after entering the adjustment set.
- When the display other than 0.0. on the display panel 3 appears while pressing a key by mistake, press the DISP key and repeat the key operations after returning the mode to the normal display status. If the wrong key operation continues, there would be a possibility of rewriting the adjustment data of analog input and analog output of the controller and of causing malfunction in the normal operations.
- After entering the adjustment set, the controller may generate the irregular input/output conditions.

Chapter8. TROUBLESHOOTING AND CORRECTIVE MEASURES

8 - 1 Alarm Code Display

The SDC40B is designed to alternate display of the following alarm codes and normal display items in one-second intervals on display panel 1 when input failures or instrument system failures are detected.

In cases of multiple alarm codes, display of the codes is alternated with normal display items, starting in order from the alarm code with the smallest number.

Alarm code	Alarm name	Description	Corrective measure
AL01	AIR1 over-range	Air 1 exceeded 110% FS	Check AIR1 input
AL02	AIR1 under-range	Air 1 exceeded -10% FS	
AL03	AIR2 over-range	Air 2 exceeded 110% FS	Check AIR2 input
AL04	AIR2 under-range	Air 2 exceeded -10% FS	
AL05	AIR3 over-range	Air 3 exceeded 110% FS	Check AIR3 input
AL06	AIR3 under-range	Air 3 exceeded -10% FS	
AL07	AIR1 RTD line break A	Break in RTD line A	Check RTD (res. temp. detector) connected to AI1R for line break and connector connections.
AL08	AIR1 RTD line break B	Break in RTD line B	
AL09	AIR1 RTD line break C	Break in RTD line C	
AL10	MFB line break	Single or multiple breaks in MFB (lines Y, T, G)	Check the motor feedback (MFB) wiring.
AL11	MFB short circuit	Short between Y-G or Y-T-G	
AL12	MFB non-adjustable	Incorrectly wired or wrong motor	Check MFB switching relay wiring and motor specifications.
AL70	A/D 1 failure	Failure of A/D converter 1	Request servicing.
AL71	A/D 2 failure	Failure of A/D converter 2	
AL81	Board configuration failure	Incorrect board configuration	Request servicing.
AL82	Computational overflow	Computational unit processed value exceeded range	Check design data with loader.
AL83	Computational overload	Processing time exceeded cycle time	Increase computation cycle setting value with loader.
AL97	Configuration data failure	Design data or control data corrupted	Reprogram settings from loader unit.
AL98	Adjustment data failure	Adjustment data for AI or AO corrupted	Request servicing.
AL99	PROM failure	System program corrupted	

8 - 2 Key Input Related Trouble

■ Pressing PARA key enables protect setting only

Cause	Corrective measure
The setting transition option for protect setting is set to "0".	Reset using any value from 1 to 5.
The PARA key's keylock function is on.	Reset the protect's Loc setting to disable PARA keylock.

■ AUTO key is ineffective in normal display mode

Cause	Corrective measure
Interlock manual mode is enabled.	Change back from emergency operation mode to normal operation mode. (See Section 5-7 Modes on page 5-19.)
The AUTO key's keylock function is on.	Reset the protect's Loc setting to disable AUTO keylock.
The MOD or MODX unit has been registered.	Connect the internal AKY signal to MOD or MODX unit.

■ CAS key is ineffective in normal display mode

Cause	Corrective measure
Interlock manual mode is enabled.	Change back from emergency operation mode to normal operation mode. (See Section 5-7 Modes on page 5-19.)
The CAS key's keylock function is on.	Reset the protect's Loc setting to disable CAS keylock.
The MOD or MODX unit has been registered.	Connect the internal AKY signal to MOD or MODX unit.
Control is set to "0".	Reset to control types 1 to 3.

■ MAN key is ineffective in normal display mode

Cause	Corrective measure
Interlock manual mode is enabled.	Change back from emergency operation mode to normal operation mode. (See Section 5-7 Modes on page 5-19.)
The MAN MAN key's keylock function is on.	Reset the protect's Loc setting to disable MAN keylock.
The MOD or MODX unit has been registered.	Connect the internal AKY signal to MOD or MODX unit.
MAN computational unit is not registered.	Register the MAN computational unit.

■ AT key is ineffective in normal display mode

Cause	Corrective measure
Manual mode is enabled.	Change back from emergency operation mode to normal operation mode. (See Section 5-7 Modes on page 5-19.)
Interlock manual mode is enabled.	Change back from emergency operation mode to normal operation mode. (See Section 5-7 Modes on page 5-19.)
Follow mode is enabled.	Disable the follow mode. (See Section 5-7 Modes on page 5-19.)
The AT key's keylock function is on.	Reset the protect's Loc setting to disable AT keylock.
Neither the AT1 nor AT2 computational unit is registered.	Connect the internal AKY signal to AT1 or AT2 computational unit.
Setup data setting C18 (selects AT method) is set to "0".	Reset to 1 to 6.
Setup data setting C18 (selects AT method) is set to 1 to 3 (executes PID1 AT) and: 1. PID1 computational unit is not registered. 2. PID computation mode 1 is set for derivative-based PID in control computational data settings.	Does not operate with settings described to the left.
Setup data setting C18 (selects AT method) is set to 1 to 3 (executes PID2 AT) and: 1. PID2 computational unit is not registered. 2. PID computation mode 2 is set for derivative-based PID in control computational data settings.	Does not operate with settings described to the left.

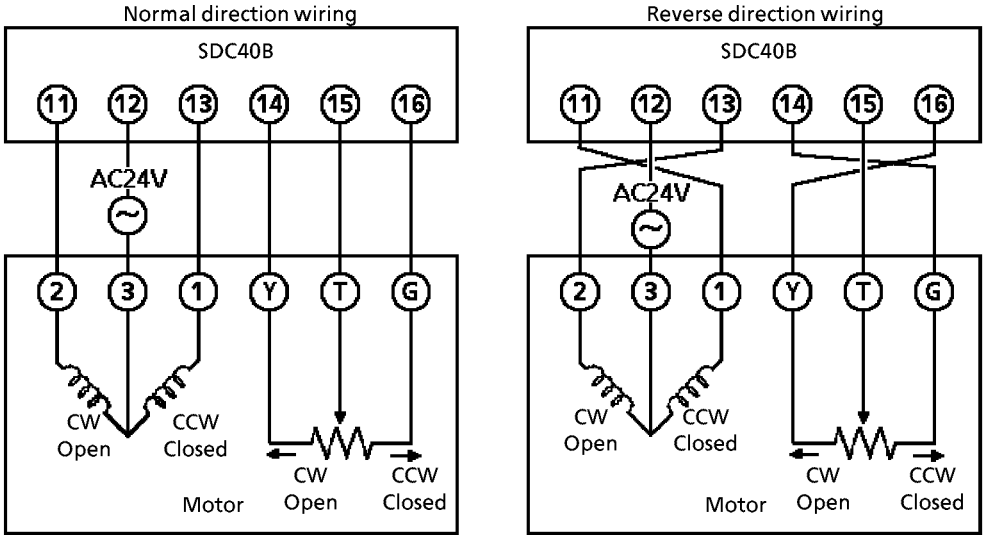
8 - 3 Motor Adjustment Not Possible

The motor and controller can be connected using the normal and reverse (two configurations) wiring configurations shown below. With normal wiring, the motor rotates in the clockwise direction as controller output increases.

In cases, such as cooling control, when reverse motor operation is desired the following two methods are used.

- Applying a direction switching function to the controller while using the same wiring.
- Using two different wiring configurations.

The SDC40B is capable of switching motor direction. Adopting a normal direction wiring configuration makes SDC40B's control in either direction very simple and recovery easy when failures occur. Adopting a normal direction wiring configuration is strongly recommended.



CW : clockwise
CCW : counterclockwise

The SDC40B is equipped with functions (AL10 to AL12) for detecting incorrect motor wiring connections and motor feedback line breaks and short circuits.

As with normal direction wiring, the SDC40B will detect reverse direction wiring as a normal condition and not issue any alarms. And if the C19 setting in setup data is left at the factory default of "0", operation will continue even when motor feedback (MFB) line breaks occur.

The tables below show examples of how the wiring configurations function when automatic motor adjustment (setup data C20 set to 1 is performed. Let the entries in the "Display panel 2" columns in the tables serve as sample values. The alarm is displayed after the motor becomes fully open or fully closed.

■ Standard normal direction wiring

Display panel 1	ON LED	Display panel 2	Motor direction	Remarks
CAL ↓ CAoP	OT2 OT1	Decelerates from 1000 → 500 and stabilizes Accelerates from 500 → 9500 and stabilizes	CCW CW	Motor connectors 1 and 2 have been wired for normal if rotation is counterclockwise when OT2 lights up.

■ Standard reverse direction wiring

Display panel 1	ON LED	Display panel 2	Motor direction	Remarks
CAL ↓ CAoP	OT2 OT1	Decelerates from 9000 → 500 and stabilizes Accelerates from 500 → 9500 and stabilizes	CW CCW	Motor connectors 1 and 2 have been wired for reverse if rotation is clockwise when OT2 lights up.

■ Alarm codes and their causes when wiring errors are detected

Display panel 1	ON LED	Display panel 2	Motor direction	Alarm Code	Cause
C A.C L ↓ C A.o P	OT2 OT1	Accelerates, then stabilizes Decelerates, then stabilizes	CCW CW	A L 1 2	G ⇔ Y reversed
C A.C L ↓ C A.o P	OT2 OT1	Decelerates, then stabilizes Stabilizes at 15000	CCW CW	A L 1 2	T ⇔ G reversed
C A.C L	OT2	Stabilizes at 15000	CCW	A L 1 1 A L 1 2	T ⇔ Y reversed
C A.C L ↓ C A.o P	OT2 OT1	Accelerates, then stabilizes Decelerates, then stabilizes	CW CCW	A L 1 2	1 ⇔ 2 reversed
C A.C L	OT2	Stabilizes at 15000	CW	A L 1 1 A L 1 2	T ⇔ G reversed with 1 ⇔ 2 reversed
C A.C L ↓ C A.o P	OT2 OT1	Accelerates, then stabilizes Stabilizes at 15000	CW CCW	A L 1 2	T⇔ Y reversed with 1 ⇔ 2 reversed

8 - 4 SDC40B Loader Communication Not Possible

When「 COMMUNICATION ERROR. Check connections. Repeat read and write operation. 」 appears on the screen of the SLPC4B Personal Computer Loader, the following causes are considered:

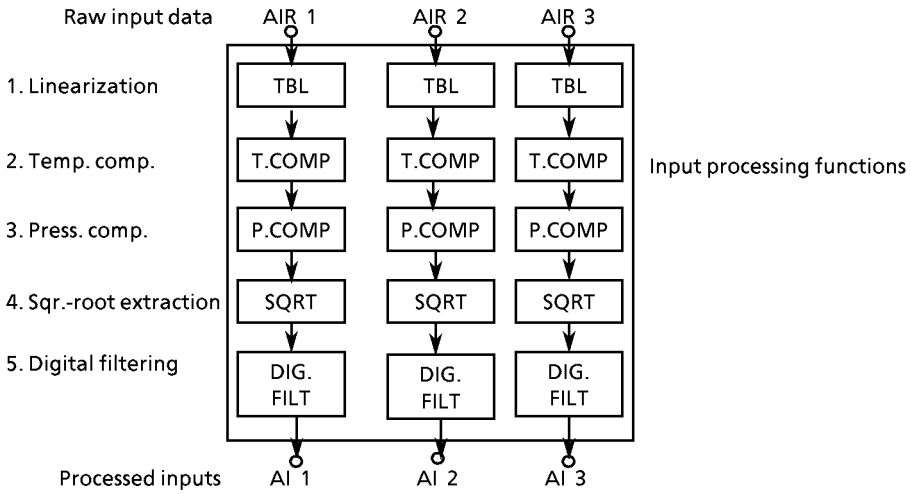
- The password function is disabling the SDC40B loader communication.
  (Refer to Page 7-69 on 7-10 Password functions on the password function.)
- The dedicated serial cable between the controller loader jack and the serial board of a personal computer is not correctly connected.
- The dedicated serial cable is broken down.
- The loader jack of the controller is broken down.
- The serial board of the personal computer is in failure.

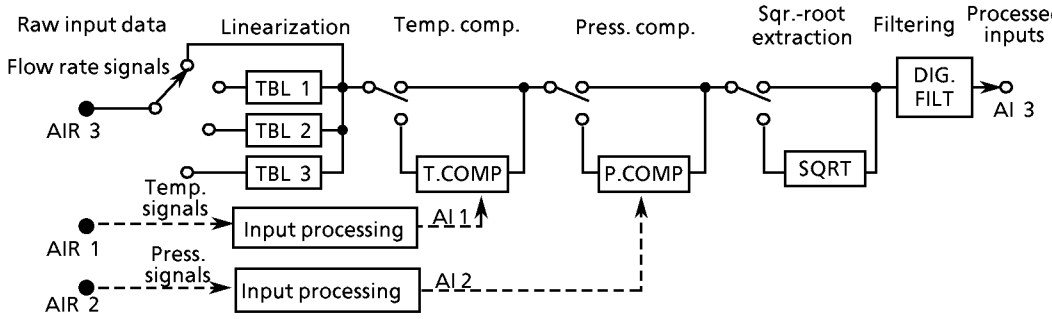
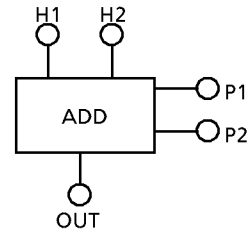
Chapter 9. SPECIFICATIONS

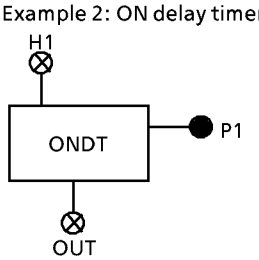
9 - 1 Specifications

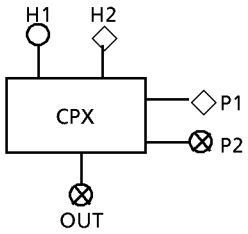
Item		Specification
Analog input 1 (AIR 1)	Input types	The following multirange: (See page 9-8) Thermocouple: K, E, J, T, B, R, S(JIS C 1602-1981) WRe5-26(Hoskins documents) PR40-20(Johnson Matthey documents) Ni-Ni•Mo(General Electric documents) N(N.B.S.Monograph 161) PLII(Engelhard Industries documents (IPTS68)) DIN U, DIN L(DIN 43710-1985) Golden iron chromel(Hayashi Denko documents) RTD: Pt100, JPt100(JIS C 1604-1989) DC current: 4 to 20mA, 0 to 20mA DC voltage: 0 to 10mV, -10 to +10mV, 0 to 100mV, 0 to 1V, -1 to +1V, 1 to 5V, 0 to 5V, 0 to 10V
	Input indicating accuracy	±0.1%FS±1U(This may be affected by indication value conversion and ranges understand conditions)
	Input sampling cycle	0.1 to 0.5s (depends on computation cycle)
	Input bias current	Thermocouple and DC voltage input: Max.±1.3μA (peak value under standard conditions) The range above 1V is max. -3μA
	Input impedance	DC current input: 50Ω±10% (under operating conditions)
	Measuring current	RTD: 1.04mA±0.02mA: Current input on terminal A
	Effect of wiring resistance	Thermocouple, DC current and DC voltage: Variation in indicating value due to input conversion when wiring resistance at both ends is 250 • 0 to 10mV, -10 to +10mV: 35μV max. • 0 to 100mV: 60μV max. • Others: 750μV max. RTD: ±0.01% FS/Ωmax. in a wiring resistance range of 0 to 10Ω. ±0.02% FS/Ωmax. in a range with a minimum resolution of 0.01°C. The allowable wiring resistance is 85max. (A zener barrier is available only for 0.1°C resolution range and requires on-site adjustment.)
	Allowable parallel resistance	Allowable parallel resistance for thermocouple break detection is 1MΩmin.
	Maximum allowable input	Thermocouple and DC voltage input: -5 to +15V DC current input: 28mA
	Burnout	Internal upscale and downscale selection
	Over range detection threshold	110% FS or more: upscaled -10% FS or less: downscaled (However, inputs in the -200.0 to +500.0°C range of JIS Pt100 and the -200.0 to +500.0°C range of JIS JPt100 are not downscaled. The indicating values lower limit for B input (0.0 to 1800.0°C) is 20°C.)
	Cold junction compensation accuracy	±0.5°C (under standard conditions)
	Influence of surrounding temperature on cold junction compensation	±0.2°C(at 0 to 50°C range)
	Cold junction compensation method	Internal or external compensation (at 0°C) selectable
	Scaling	-19999 to + 26000U(These settings available for linear inputs only. Reverse scaling and decimal point repositioning can be performed with resolutions to 1/20000.)
Analog input 2 (AIR 2)	Type of inputs	4 to 20mAdc, 1 to 5Vdc. See page 9-9.
	Input indicating accuracy	±0.1% FS ±1U (display value conversion under standard conditions)
	Input sampling cycle	0.1 to 0.5s (depends on computation cycle)
	Input bias current	1 to 5Vdc input: ±10μAmax. (under operating conditions)
	Input impedance	1 to 5Vdc input: 1MΩmin. (under operating conditions) 4 to 20mAdc input: 50Ω±10% (under operating conditions)
	Maximum allowable input	1 to 5Vdc input: 0 to 6V 4 to 20mAdc input: 28mA
	Burnout	Downscale
	Over range detection threshold	110% FS or more: upscaled -10% FS or less: downscaled
	Scaling	-19999 to + 26000U (Reverse scaling and decimal point repositioning can be performed with resolutions to 1/20000.)
Analog input 3 (AIR 3)	Type of inputs	1 to 5Vdc. See page 9-9.
	Input indicating accuracy	±0.1% FS ±1U (display value conversion under standard conditions)
	Input sampling cycle	0.1 to 0.5s (depends on computation cycle)
	Input bias current	±10μA max. (under operating conditions)
	Input impedance	1MΩmin. (under operating conditions)

Item		Specification
Analog input 3 (AIR3)	Maximum allowable input	0 to 6V
	Burnout	Downscale
	Over range detection threshold	110% FS or more: upscaled -10% FS or less: downscaled
	Scaling	-19999 to + 26000U (Reverse scaling and decimal point repositioning can be performed with resolutions to 1/20000.)
Digital inputs (DI1 to DI12)	No. of inputs	12
	Types of connectable outputs	No-voltage contacts (relay contacts) and open collector (current sink to ground)
	Terminal voltage (open)	12V +0.6V/-1.6V (under operating conditions) across common terminal (terminal 25) and each input terminal.
	Terminal current (short-circuited)	6mA +0.6mA/-1.0mA (under operating conditions) across each terminal
	Allowable contact resistance (dry contact)	On: 700Ω max. Off: 10 kΩ min. (under operating conditions)
	Residual voltage (open collector on)	3V max. (under operating conditions)
	Leakage current (open collector off)	0.1mA max. (under operating conditions)
	Parallel connection to other instruments	Can be connected to Yamatake-Honeywell's SDC40 series instruments
	Input sampling cycle	0.1 to 0.5s (depends on computation cycle)
	ON detection min. hold time	0.2 to 1.0s (double the computation cycle)
Input processing	As shown below, the controller can accept and process five analog inputs: approximation by linearization table, temperature compensation, pressure compensation, square-root extraction and digital filtering.	



<table>
<tr><th colspan="2">Item</th><th colspan="4">Specification</th></tr>
<tr><td>Input processing block</td><td colspan="5"> 
</td></tr>
<tr><td></td><td>Linearization</td><td colspan="4">Three sets of 16 approximation by linearization tables are provided. They can be allocated to analog inputs 1, 2 and 3.</td></tr>
<tr><td></td><td>Temp. comp. (T.COMP)</td><td colspan="4">Compensation flow rate signal = $\frac{\text{Desin(target) temperature + constant}}{\text{current temperature + constant}}$ × flow rate signal
°C or °F can be selected as units.</td></tr>
<tr><td></td><td>Press. comp. (P.COMP)</td><td colspan="4">Compensation flow rate signal = $\frac{\text{Current pressure + constant}}{\text{Desin (target) pressure + constant}}$ × flow rate signal
MPa, KPa, Pa, kgf/cm^2 or mmH_2O can be selected as units.</td></tr>
<tr><td></td><td>Sqr-root extraction (SQRT)</td><td colspan="4">Dropout value: 0.0 to 100.0% variable</td></tr>
<tr><td></td><td>Digital filtering (DIG.FILT)</td><td colspan="4">First order lag computation: output = $\frac{1}{1+T\times S}$ × input
T: filter constant 0.0 to 120.0 seconds (no filtering at 0.0)
S: Laplacian</td></tr>
<tr><td>Computation processing block</td><td colspan="5">About 80 algorithms can be assigned to a total of 50 computational units. Each computational expression has the following format and can operate on up to four inputs. See page 9-10 for details.
OUT = f(H1, H2, P1, P2)
Example 1: Addition
 

(OUT = P1 × H1 + P2 × H2)
Example 2: ON delay timer
 

(OUT asserted after P1 completes)
Example 3: Integration pulse output II
 

(Integration performed on input H1 and pulse output as per integral range specified by H2 and P1.)</td></tr>
<tr><td></td><td>Computation cycle settings</td><td colspan="4">0.1 to 0.5s (settable in 0.1 sec increments)</td></tr>
<tr><td></td><td>PID control and output unit</td><td colspan="4">Performed by PID computational unit 1 (PID1) or PID computational unit 2 (PID2) in the computational expressions.
Of the 50 computational units, only one each can be assigned as PID computational units 1 and 2.</td></tr>
<tr><td></td><td></td><td colspan="4">Control type
<table>
<tr><th></th><th>PID computational unit(PID1)</th><th>PID computational unit 2(PID2)</th></tr>
<tr><td>0</td><td>Local setting</td><td>Unused</td></tr>
<tr><td>1</td><td>Remote/local setting</td><td>Unused</td></tr>
<tr><td>2</td><td>Remote/local setting</td><td>Remote setting</td></tr>
<tr><td>3</td><td>Local setting</td><td>Remote/local setting</td></tr>
</table>
Types 0 to 3 are set at setup. Although two can be used as PID computational units, only one computational unit can be used as a MAN computational unit.</td></tr>
<tr><td></td><td></td><td colspan="4">
<table>
<tr><td>Serial No.</td><td></td><td>2G</td><td>5G</td></tr>
<tr><td rowspan="3">Analog output signal</td><td>AO1</td><td>M/M drive relay contact output</td><td>Current output (4 to 20mA DC)</td></tr>
<tr><td>AO2</td><td>None</td><td>Current output (4 to 20mA DC)</td></tr>
<tr><td>AO3</td><td>Current output (4 to 20mA DC)</td><td>Current output (4 to 20mA DC)</td></tr>
<tr><td colspan="2">Control operation</td><td>Position proportional PID and currentproportional PID</td><td>Current proportional PID</td></tr>
<tr><td colspan="2">computation mode</td><td colspan="2">Normal or derivative-based selectable using PID computational units.</td></tr>
</table></td></tr>
</table>

Item		Specification		
Computation processing block	PID control and output unit	Proportional band (P)		0.1 to 999.9% (ON/OFF disabled)
		Integral time (I)		0.0 to 6000.0s (PD activates at I = 0)
		Derivative time (D)		0.0 to 6000.0s (PI activates at D = 0)
		Integral limit		Lower limit: -200.0 to upper integral limit (%) Upper limit: lower integral limit to 200.0 (%)
		Dead band		0.0 to 100.0% (no dead band at 0)
		Deviation rate limit		0.0 to 100.0%/computation cycle (no limit at 0)
		Manual reset		0.0 to 100.0%
		No. of PID groups		8 groups (shared by PID computational units 1 and 2)
		PID auto-tuning		Neuro, fuzzy (with two degrees of freedom) and smart methods are used in addition to the limit cycle method to set PID auto-tuning. (supported only in normal PID computation mode)
		RSP ratio		-999.9 to +999.9% of RSP of PIDoperation units1 and 2
		RSP bias		-999.9 to +999.9% of RSP of PID operation units1 and 2
		Deviation alarm		0.0 to 100.0% of SP-PV, the absolute value of PID computational units 1 and 2
		Upper PV alarm limit		-10.0 to +110.0% of PV of PID computational units1 and 2
		Lower PV alarm limit		-10.0 to +110.0% of PV of PID computational units1 and 2
		Alarm hysteresis		0.0 to 100.0% for deviation alarm, upper PV alarm limit, and lower PV alarm limit
Output processing block	Analog outputs (AO1 to AO3)	Serial No.2G AO1	M/M drive relay contact output	Contact system: 2SPST Contact rating : 2.5 A(30V DC L/R = 0.7ms) 4 A(120V AC cos ϕ = 0.4) 2 A(240V AC cos ϕ = 0.4) Allowable contact voltage: 250V AC resistive load; 125V DC resistive load 125V DC L/R = 0.7ms 250V AC cos ϕ = 0.4 Maximum on-off power: 75W(L / R = 0.7ms) 480VA(cosϕ = 0.4) Mechanical life: 10,000,000 MIN. repetitions Electrical life : 100,000 MIN. repetitions(cosϕ = 0.4 at contact rating and 30 repetitions per minute) Minimum switching voltage: 5V Minimum switching current: 100mA MFB (motor feedback) input range: 100 to 2500 Ω MFB (motor feedback) line-break control: Whether action is continued is determined by MFB estimated position setting.
		Serial No.2G AO3 Serial No.5G AO1 AO2 AO3	4 to 20mA	Current output Output current: 4 to 20mA DC Allowable load resistance: 600Ω max.(under operating conditions) Output accuracy : within 0.1% FS(under operating conditions) Output resolution: 1/10000 Inrush current : 25mA max. 50ms max.(with250-load) Maximum output current: 21.6mA DC Minimum output current: 2.4mA DC Opening terminal voltage: 25V max.(AO1), 18V max.(AO2,AO3) Output update cycle: 0.1 to 0.5s(depends on computation cycle)

Item		Specification		
Output processor	Digital outputs (DO1 to DO8)	DO1 DO2	SPST relay contact	Electrical rating:250V AC 30V DC 1 A resistive load Mechanical life: 20,000,000 min. repetitions Electrical life: 100,000 min. repetitions (at rated capacity) Minimum switching voltage: 10V Minimum switching current: 10mA
		DO3	SPDT relay contact	Electrical rating: 250V AC 30V DC 2 A resistive load Mechanical life: 50,000,000 min. repetitions Electrical life:100,000 min .repetitions(at rated capacity) Minimum switching voltage: 10V Minimum switching current: 10mA
		DO4 to DO8	Open collector	External supply voltage: 10 to 29V DC Maximum load current: 70mA per point Leakage current when off: 0.1mA
Indications and settings	Display panel 1	Green 5-digit, 7-segment LED This panel normally displays PV values. Item codes are displayed in control data setting mode and alarm codes are displayed when alarms are generated.		
	Display panel 2	Orange 5-digit, 7-segment LED This panel normally displays SP values. Set values are displayed in control data setting mode.		
	Display panel 3	Orange 2-digit, 7-segment LED This panel displays the difference between LSP and RSP values in normal indicating mode when display panel 2 shows SP values. In control data setting mode, item codes are displayed.		
	LED bar display	12-segment green and amber LED Analog monitor (includes control output) which doubles as a digital monitor.		
	Status display	18-segment LED SP, LCK, OUT, CH1 (PID computational unit 1), CH2 (PID computational unit 2), FLW (follow mode), AUT (auto mode), MAN (manual mode), CAS (cascade mode), IM (interlock manual mode), AT (auto-tuning), FZY (during fuzzy switching), OUT1, OUT2, OUT (bar graph control output), UF1, UF2, UF3 (user defined)		
	Operation keys	13-segment rubber keys (of which two are user definable)		
	Loader connecting port	1 (dedicated cable with stereo miniplugs)		
Modes	Normal operating mode	Auto mode	PID computational units control constants (LSP).	
		Manual mode	MAN computational unit outputs manual settings. (Note that only one MAN computational unit can be used.)	
			Only PID computational units perform integral operations.	
		Cascade mode	PID computational units control cascade settings (RSP).	
		Follow mode	MAN computational unit outputs follow inputs to theSDC40B.	
	Emergency operating mode	Interlock manual mode: This mode is activated when an analog overflow, computational overflow or computational overload is detected.		
Communications	Communications system	Communications standard	RS-485	RS-232C
		Network	Multidrop (SDC40B provided with only slave node functionality.) 1 to 16 units max. (DIM) 1 to 32 units max. (CMA, SCM)	Point to point; (SDC40B provided with ,only slave node functionality.)
		Data flow	Half-duplex	Half-duplex
		Synchronization	Start-stop synchronization	Start-stop synchronization
	Interface system	Transmission system	Balanced (differential)	Unbalanced
		Data line	Bit-serial	Bit-serial
		Signal line	5 transmit/receive lines (3-wire connection also possible)	3 transmit/receive lines

Item		Specification		
Communications	Interface system	Transmission rate	4800, 9600 bps	4800, 9600 bps
		Transmission distance	max. 500m (total) (300m for MA500 DIM connection)	15m max.
		Misc.	Conforms to RS-485	Conforms to RS-232C
	Display characters	Char. bit count	11 bits/character	11 bits/character
		Format	1 start bit, even parity, 1 stop bit; or 1 start bit, no parity, 2 stop bits	1 start bit, even parity 1 stop bit; or 1 start bit, no parity, 2 stop bits
		Data length	8 bits	8 bits
	Isolation	All inputs and outputs are completely isolated		
	Note : RS-485 communications can be performed by connecting to a computer equipped with an RS-485 interface or to Yamatake corporation's MX200 or MA500 (DK link II DIM) controllers.			
General specifications	Memory backup	User settings (design data and control data): non-volatile memory (EEPROM) Mode, local SP, control output (AO1) and hold operations: RAM backed up by super-capacitor (stored for 24-hours)		
	Rated power voltage	AC Model	100 to 240Vac 50/60 Hz	
		DC Model	24Vdc	
	Allowable power supply voltage	AC Model	90 to 264Vac 50/60 Hz	
		DC Model	21.6 to 26.4Vdc	
	Power consumption	AC Model	30VA max.	
		DC Model	12W max.	
	Power switching inrush current	30 A max. for 10ms (under operating conditions) Note: When starting up a number of SDC40Bs simultaneously, ensure ample power is supplied or stagger their startup times. Otherwise, the controllers may not start normally due to inrush current-induced voltage drop. (Voltage must stabilize within 2 seconds after power ON.)		
	Power ON operation	Reset time: 15s max. (time until normal operation possible under normal operating conditions)		
	Allowable transient power loss	20ms max. (under operating conditions)		
	Power failure recovery operations	Hot/cold start selectable (see below)		

Selection	RAM backup	Actual outage recovery process	Description		
			Mode	Local (SP)	Control output (AO1)
Hot start	During normal operation	Hot start	Before outage	Before outage	Before outage
	During failure	Cold start	Preset mode	Preset mode	Preset mode
Cold start	N/A (not applicable)				

Insulation resistance	Min. 20MΩ between power terminal 1 or 2 and ground terminal (using 500Vdc meggar)	
Dielectric strength	AC Model	1500Vac 50/60 Hz for 1 min across power terminal and ground terminal 1500Vac 50/60 Hz for 1 min across relay output and ground terminal 500Vac 50/60 Hz for 1 min across non-power terminal and ground terminal 500Vac 50/60 Hz for 1 min across isolated terminals
	DC Model	500Vac 50/60 Hz for 1 min across power terminal and ground terminal 1500Vac 50/60 Hz for 1 min across relay output and ground terminal 500Vac 50/60 Hz for 1 min across non-power terminal and ground terminal 500Vac 50/60 Hz for 1 min across isolated terminals

Item		Specification		
General Specifications	Standard conditions	Ambient temperature	23 ±2°C	
		Ambient humidity	60 ±5% RH	
		Rated power voltage	AC Model	105Vac ±1%
			DC Model	24Vdc ±5%
		Power frequency	AC Model	50± 1Hz or 60±1Hz
		Vibration resistance	0 m/s^2	
		Impact resistance	0 m/s^2	
		Mounting angle	Reference plane (vertical) ±3°	
	Operating conditions	Ambient temperature	0 to 50°C	
		Ambient humidity	10 to 90% RH (non-condensing)	
		Rated power voltage	AC Model : 100 to 240Vac DC Model : 24 Vdc	
		Power frequency	AC Model 50± 2Hz or 60±2Hz	
		Vibration resistance	0 to 1.96 m/s^2	
		Impact resistance	0 to 9.8 m/s^2	
		Mounting angle	Reference plane (vertical) ±10°	
		Altitude	2000m max.	
	Transport/storage conditions	Ambient temperature	-20 to +70°C	
		Ambient humidity	10 to 95% RH (non-condensing)	
		Vibration resistance	0 to 4.90 m/s^2 (10 to 60 Hz for 2 hours each in X, Y and Z directions)	
		Impact resistance	0 to 490 m/s^2 (3 times vertically)	
		Package drop test	Drop height: 60cm (1 angle 3 edges and 6 planes; free fall)	
	Installation mode	Permanently connected type controller, indoor installation, panel-mounted		
	Applicable standards	EN61010-1, EN61326		
	Over-voltage categorry	Category II (IEC60364-4-443, IEC60664-1)		
	Pollution degree	2		
	Fuse	Rated	IEC127	
		Cutoff speed	Delayed operation type (T)	
		Rated voltage	250V	
		Rated current	1A	
	Material, mask/case	Mask: Multilon	Case: Polycarbonate	
	Color, mask/case	Mask: dark gray	Case: Light gray	
	Installation	Specially designed mounting bracket		
	Mass	Approx. 900g		

■ List of Accessories

	Product	Parts No.	Quantity
Standard accessories	Units indicating label	N-3132	1
	Mounting bracket	81405411-001	2
Options	Hard dust-proof cover set	81446083-001	—
	Soft dust-proof cover set	81446087-001	—
	Terminal cover set	81446084-001	—
	Smart Loader Package	SLPC4B-001H	—
Related publications	User's manual: Computational Functions	CP-UM-1680E	—
	User's manual: DIGITRONIK CPL Communications	CP-UM-1683E	—
	User's manual: Smart Loader Package	CP-UM-1681E	—

■ Input types and ranges (selected at setup)

● Input 1: Thermocouples, RTDs, DC current and DC voltage

Input format	Range No.	Code	Celsius Range(°C)	Fahrenheit Range(°F)
K (CA)	0	K09	0.0 to 1200.0	0 to 2400
K (CA)	1	K08	0.0 to 800.0	0 to 1600
K (CA)	2	K04	0.0 to 400.0	0 to 750
K (CA)	3	K29	−200.0 to +1200.0	−300 to +2400
K (CA)	4	K44	−200.0 to +300.0	−300 to +700
K (CA)	5	K46	−200.0 to +200.0	−300 to +400
E (CRC)	6	E08	0.0 to 800.0	0 to 1800
J (IC)	7	J08	0.0 to 800.0	0 to 1600
T (CC)	8	T44	−200.0 to +300.0	−300 to +700
B (PR30-6)	9	B18	0.0 to 1800.0	0 to 3300
R (PR13)	10	R16	0.0 to 1600.0	0 to 3100
S (PR10)	11	S16	0.0 to 1600.0	0 to 3100
W (WRe5-26)	12	W23	0.0 to 2300.0	0 to 4200
W (WRe5-26)	13	W14	0.0 to 1400.0	0 to 2552
PR40-20	14	D19	0.0 to 1900.0	0 to 3400
Ni-Ni·Mo	15	Z13	0.0 to 1300.0	32 to 2372
N	16	U13	0.0 to 1300.0	32 to 2372
PL II	17	Y13	0.0 to 1300.0	32 to 2372
DIN U	18	Z08	−200.0 to +400.0	−300 to +750
DIN L	19	Z07	−200.0 to +800.0	−300 to +1600
JIS'89 Pt100 (IEC Pt100Ω)	32	F50	−200.0 to +500.0	−300.0 to +900.0
	33	F46	−200.0 to +200.0	−300.0 to +400.0
	34	F32	−100.0 to +150.0	−150.0 to +300.0
	35	F36	−50.0 to +200.0	−50.0 to +400.0
	36	F38	−60.00to +40.00	−76.00to +104.00
	37	F33	−40.00to +60.00	−40.00to +140.00
	38	F05	0.0 to 500.0	0.0 to 900.0
	39	F03	0.0 to 300.0	0.0 to 500.0
	40	F01	0.00to 100.00	0.00to 200.00
JIS'89 J Pt100	48	P50	−200.0 to +500.0	−300.0 to +900.0
	49	P46	−200.0 to +200.0	−300.0 to +400.0
	50	P32	−100.0 to +150.0	−150.0 to +300.0
	51	P36	−50.0 to +200.0	−50.0 to +400.0
	52	P38	−60.00to +40.00	−76.00to +104.00
	53	P33	−40.00to +60.00	−40.00to +140.00
	54	P05	0.0 to 500.0	0.0 to 900.0
	55	P03	0.0 to 300.0	0.0 to 500.0
	56	P01	0.00to 100.00	0.00to 200.00
4 to 20mA	64	C01	Scale setting range: -19999 to +26000 (Decimal point repositioning and reverse scaling possible)	
0 to 20mA	65	C08		
0 to 10mV	66	M01		
−10 to +10mV	67	L02		
0 to 100mV	68	L01		
0 to 1V	69	L04		
−1 to +1V	70	L08		
1 to 5V	71	V01		
0 to 5V	72	L05		
0 to 10V	73	L07		

- Items that do not meet stated indication accuracy (± 01 % FS ± 1 U)
  - · K and T thermocouples ± 1℃ ± 1U for temperatures below -100℃
  - · B thermocouples:
    ± 4.0% FS ± 1U for temperatures below 260℃
    ± 0.4%FS ± 1U for temperatures ranging from 260 to 800℃
    ± 0.2% FS ± 1U for temperatures ranging from 800 to 1800℃
  - · R and S thermocouples:
    ± 0.2% FS ± 1U for temperatures below 100 ℃
    ± 0.15% FS ± 1U for temperatures in the range 100 to 1600℃
  - · PPR40-20 thermocouples:
    ± 2.5% FS ± 1U for temperatures below 300 ℃
    ± 1.5% FS ± 1U for temperatures ranging from 300 to 800 ℃
    ± 0.5% FS ± 1U for temperatures ranging from 800 to 1900℃
  - · RTDs: ± 0.15 % FS ± 1 U for the range below 2 decimal places
  - · ± 0.15 % FS ± 1 U for the range 0 to 10 mV
  - · DIN U thermocouples:
    ± 2℃ FS ± 1U for temperatures below -100℃
    ± 1℃ FS ± 1U for temperatures ranging from -100 to 0℃
  - · DIN L thermocouples: ± 1.5℃ FS ± 1U for temperatures below -100℃

● Input 2: DC current and DC voltage

Input Format	Range No.	Code	Range (Programmable)
4 to20mA	0	C01	Scale setting range: -19999 to + 26000 (Decimal point repositioning and reverse scaling possible)
1 to 5V	1	V01	

● Input 3: DC voltage

Input Format	Code	Range (Programmable)
1 to 5V	V01	Scale setting range: -19999 to + 26000 (Decimal point repositioning and reverse scaling possible)

■ Data and setting procedures

◎ :can be set, ○ :some can be set, △ :can be monitored, − :can be neither set nor monitored

Category	Data	Description	From Console	From PC Loader
Design data	Computational unit data	Specifies computational expressions, connections,etc.	△	◎
	Output processing data	Specifies output processing connections.	△	◎
Control data	Setup data	Specifies control types and computation cycles.	○	◎
	Input processing data	Specifies input processing types, etc.	○	◎
	Control computational data	Specifies PID computation types, PID groups to be used, etc.	○	◎
	PID parameters	Specifies control parameters for PID groups 0 to 7.	◎	◎
	Linearization data	Specifies linearization format.	○	◎
	Variable parameters	Specifies computation coefficients, constants, etc.	◎	◎
	Engineering unit parameters	For setting engineering units.	◎	◎
	UF key processing data	Specifies functions assigned to user function keys (UF) 1 and 2.	○	◎
	Digital input processing data	Used as DI1 to DI12 index data.	△	◎
	ID data	Identifiers for hardware type, ROM and others not identified in EEPROM.	△	△
	Protect	Specifies keylock, etc.	◎	◎
	Trend processing	Specified when using data trend function on PC loader.	−	◎

■ List of computational expressions

No.	Computational expression	Mnemonic	Description
1	Addition	ADD	OUT = P1 × H1 + P2 × H2
2	Subtraction	SUB	OUT = P1 × H1 − P2 × H2
3	Multiplication	MUL	OUT = H1 × H2
4	Division	DIV	OUT = H1 / H2 + P1
5	Absolute value	ABS	OUT = |H1|
6	Square-root extraction	SQR	OUT = $\sqrt{H_1}$
7	Maximum value	MAX	OUT = MAX(H1、H2、P1、P2)
8	Minimum value	MIN	OUT = MIN(H1、H2、P1、P2)
9	4-point addition	SGM	OUT = H1 + H2 + P1 + P2
10	High selector/low limiter	HSE	When H1 ≧ H2, OUT is H1. When H1 < H2, OUT is H2. When used as a low limiter, H2 is lower limit value.
11	Low selector/high limiter	LSE	When H1 ≧ H2, OUT is H2. When H1 < H2, OUT is H1. When used as a high limiter, H2 is upper limit value.
12	High and low limiter	HLLM	H1 is limited by the high limit value P1 and the low limit value P2.
13	High monitor	HMS	Output is asserted when H1 exceeds high monitor value H2. (Hysteresis width is P2.)
14	Low monitor	LMS	Output is asserted when H1 falls below the low monitor value H2. (Hysteresis width is P2.)
15	Deviation monitor	DMS	Output is asserted when the deviation between H1 and H2 exceeds deviation monitor value P1. (Hysteresis width is P2.)
16	Deviation rate limiter	DRL	Limits input H1s deviation rate per minute to H2% on positive side and P1% on negative side.
17	Deviation rate monitor	DRM	Output is asserted when input H1 exceeds H2% on positive side and is within P1% on negative side compared to inputs made one minute earlier.

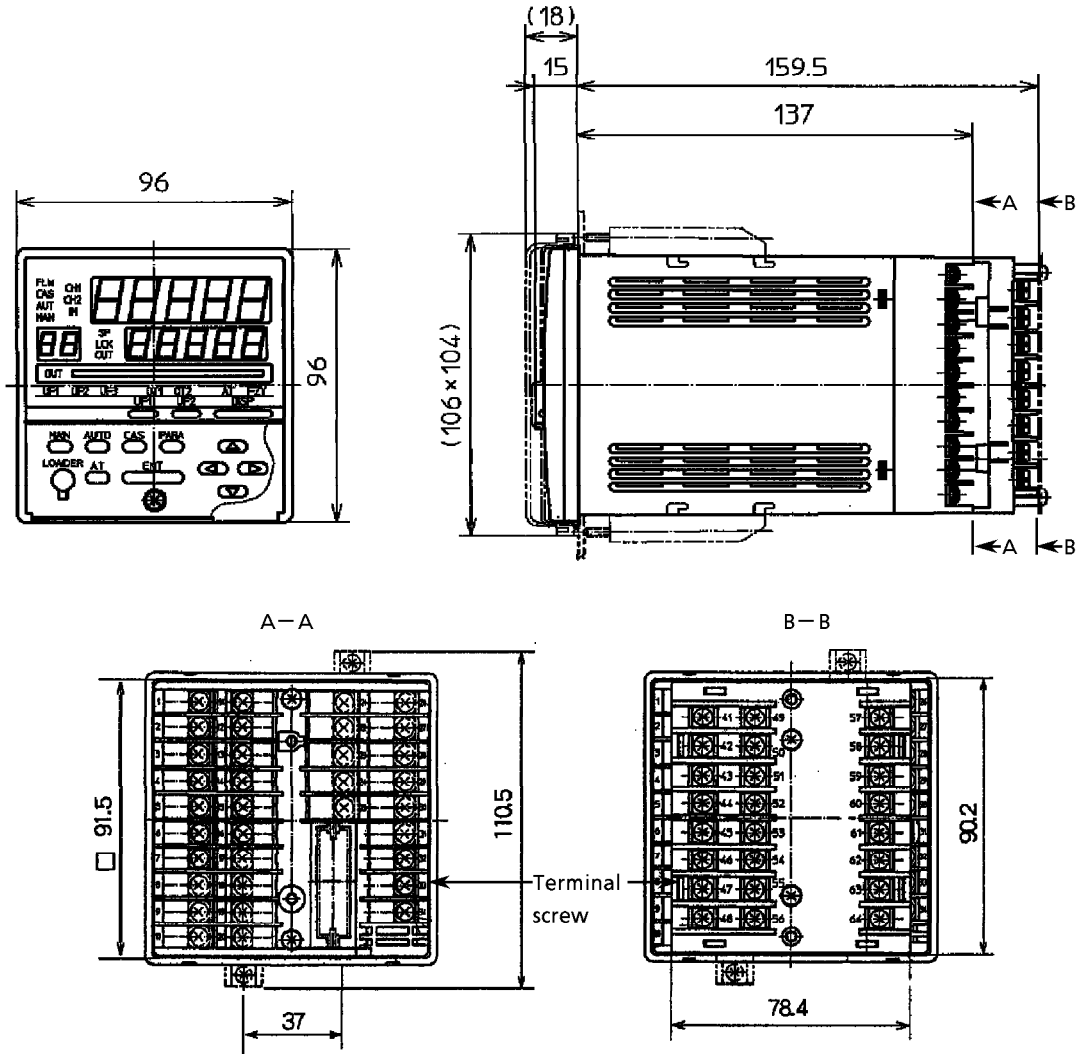
No.	Computational expression	Mnemonic	Description
18	Manual output	MAN	Enables manual output from system console.
19	Controller 1	PID1	PID controller 1 (with auto-tuning)
20	Controller 2	PID2	PID controller 2 (with auto-tuning)
21	Dead time	DED	OUT = $e^{-P1 \cdot S} \times H1$ (Input H1, the dead time, is output after P1 seconds.)
22	Lead/lag	L/L	OUT = $(1 + P1 \cdot S) / (1 + P2 \cdot S) \times H1$
23	Derivation	LED	OUT = $P1 \cdot S / (1 + P2 \cdot S) \times H1$
24	Integration	INT	OUT = $H1 / P1 \cdot S$ (Integration performed on input H1 in integral time of P1 s.)
25	Moving average	MAV	$OUT = \frac{1}{30} \sum_{i=1}^{30} H1i$ where H1i is obtained from H1 of i/30 P1s earlier.
26	Flip-flop	RS	Set input H1 holds flag data; H2 input resets the data.
27	Logical product	AND	OUT = $H1 \wedge H2 \wedge P1 \wedge P2$
28	Logical OR	OR	OUT = $H1 \vee H2 \vee P1 \vee P2$
29	Exclusive OR	XOR	OUT = $H1 \veebar H2$
30	Inversion	NOT	OUT = $\overline{H1}$
31	2-position transfer switch	SW	P1 switches between H1 and H2 percent data.
32	Softening transfer switch	SFT	Switches between H1 and H2 using a P2 (%) slope for smooth switching.
33	Timer switch	TSW	Switches between H1 and H2 using P1 time data.
34	Flag switch	FSW	Switches between H1 and H2 using P1 flag data.
35	Alternate switch	ALSW	Inverts output when the rising edge of H1 is detected.
36	Timer	TIM	Pulse generation per P1 seconds.
37	ON delay timer	ONDT	Asserts output after P1 seconds.
38	OFF delay timer	OFDT	Inhibits output after P1 seconds.
39	One-shot timer	OST	Generates pulse for P1 seconds.
40	Integration pulse output I	CPO	Outputs the number of pulses proportional to input H1.
41	Integration pulse output II	CPX	Performs integration on input H1 and outputs one pulse when the output pulse value set by P1 is reached.
42	Pulse width modulation	PWM	Asserts output in proportion to input H1 within the P1 cycle.
43	Ramp signal generation	RMP	Outputs a waveform with a rising slope
44	Logarithm	LOG	OUT is $LOG_{10}(H_1)$ or OUT is $LOG_e(H_1)$
45	Exponent	EXP	OUT is 10^{H1} or e^{H1}
46	Unused		
47	Unused		
48	Unused		
49	Unused		
50	Unused		
51	Control variable change 1	PMD1	Changes PID1 control variables. (enables changing of group numbers also)
52	Control variable change 2	PMD2	Changes PID2 control variables. (enables changing of group numbers also)
53	Mode selection (status detection)	MOD	Cycles through follow, manual, auto, and cascade modes.
54	Mode selection (edge detection)	MODX	Cycles through follow, manual, auto, and cascade modes.
55	Auto-tuning start/stop 1	AT1	Starts/stops PID1 unit auto-tuning.
56	Auto-tuning start/stop 2	AT2	Starts/stops PID2 unit auto-tuning.
57	Data hold	HOLD	Retains input H1 during outage, and outputs it as is after restart.
58	Raise/lower unit	RL	Raises output when H1 is ON (raise) and lowers it when H2 is ON (lower).
59	Reset unit	RST	Resets the interlock manual mode.
60	Not used		

No.	Computational expression	Mnemonic	Description
61	Linearization table 1	TBL1	Linearization table 1 (16-point)
62	Linearization table 2	TBL2	Linearization table 2 (16-point)
63	Linearization table 3	TBL3	Linearization table 3 (16-point)
64	Inverse linearization table 1	TBR1	Inverse function of linearization table 1 (16-point)
65	Inverse linearization table 2	TBR2	Inverse function of linearization table 2 (16-point)
66	Inverse linearization table 3	TBR3	Inverse function of linearization table 3 (16-point)
67	Time → % conversion	TTP	Converts time data to percent data.
68	% → time conversion	PTT	Converts percent data to time data.
69	Engineering unit parameter selection	EGP1	Selects engineering unit parameters for PID1 unit.
70	Engineering unit parameter selection	EGP2	Selects engineering unit parameters for PID2 unit.
71	Unused		
72	Unused		
73	Unused		
74	Unused		
75	Unused		
76	Unused		
77	Unused		
78	Unused		
79	Unused		
80	Unused		
81	% → % table 1	PTB1	Not connectable, but otherwise identical to linearization tables.
82	% → % table 2	PTB2	Not connectable, but otherwise identical to linearization tables.
83	% → % table 3	PTB3	Not connectable, but otherwise identical to linearization tables.
84	% → % table 4	PTB4	Not connectable, but otherwise identical to linearization tables.
85	% → time table 1	TTB1	Uses linearization table to convert % data to time data.
86	% → time table 2	TTB2	Uses linearization table to convert % data to time data.
87	% → time table 3	TTB3	Uses linearization table to convert % data to time data.
88	% → time table 4	TTB4	Uses linearization table to convert % data to time data.
89	Unused		
90	Unused		
91	User lamp output 1	UF1	User lamp control unit 1
92	User lamp output 2	UF2	User lamp control unit 2
93	User lamp output 3	UF3	User lamp control unit 3
94	Bar graph display switch	BLED	Selects bar graph display.
95	Additional display unit 1	DSP1	Additional display unit 1 of display panels 1 and 2
96	Additional display unit 2	DSP2	Additional display unit 2 of display panels 1 and 2
97	Additional display unit 3	DSP3	Additional display unit 3 of display panels 1 and 2
98	Additional display unit 4	DSP4	Additional display unit 4 of display panels 1 and 2
99	Unused		

9 - 2 External Dimensions

■ Main body

Unit: mm

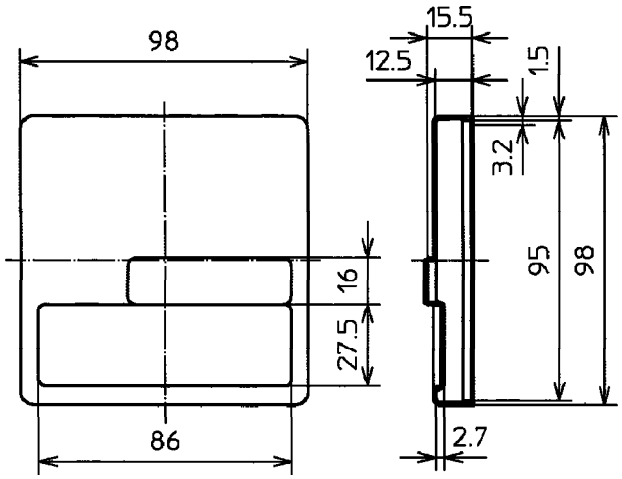


■ Soft dust-proof cover set

Parts No. 81446087-001

Unit: mm

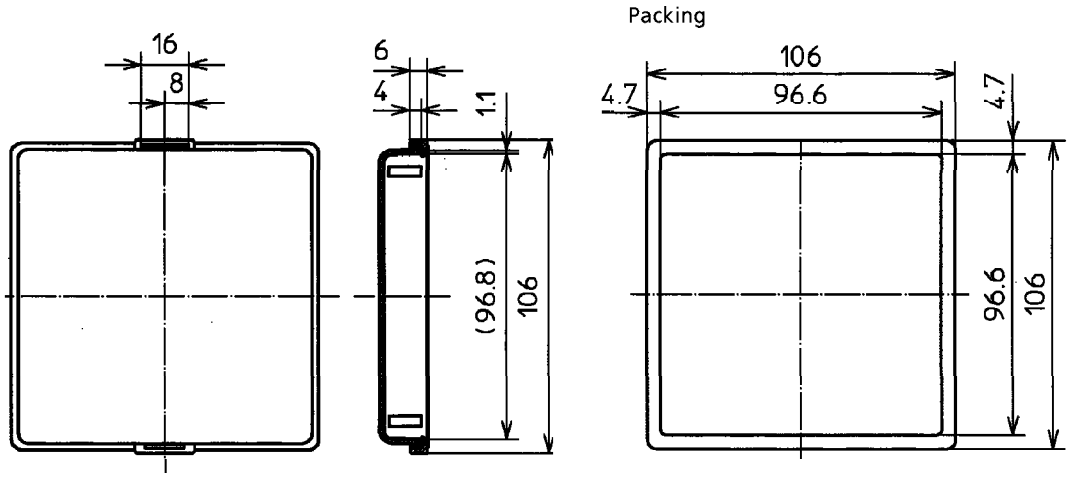
(silicon rubber, transparent)



■ Hard dust-proof cover set

Parts No. 81446083-001

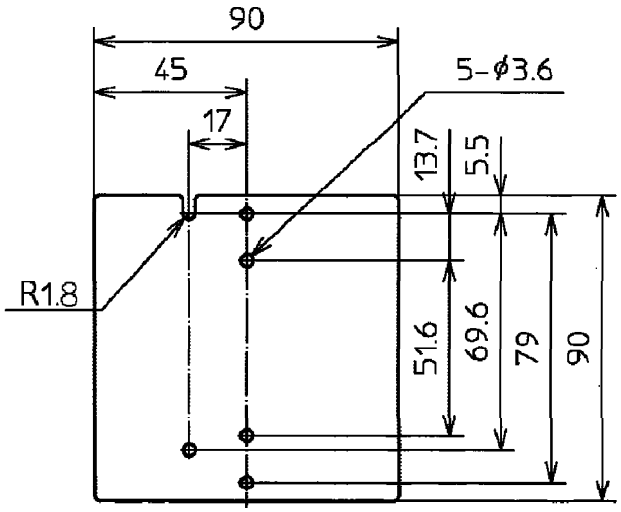
(polycarbonate, transparent)



■ Terminal cover set

Parts No. 81446084-001

(Fire/heat-resistant polyvinyl chloride, gray)



Installable on standard and extendedterminal bases.

Chapter10. MAINTENANCE

Cleaning : Clean the instrument with a soft, dry cloth when it becomes dirty.

Replacing parts : Only authorized personnel are allowed to replace parts.

Replacing fuse : In case of AC power supply models, when replacing fuses provided on the power supply circuit, use only standard parts specified below.

Standard	IEC127
Type	Time-lag (T)
Voltage rating	250V
Current rating	1.0A

Index

【A】

accessories 9-7
alarm code 8-1
analog input 1-1
analog output 1-1
approximation by linearization table/
linearization 5-7
auto balance function 5-25
auto mode 5-20
auto-tuning (AT) method selection ... 7-22

【B】

bar graph display 7-7
analog monitor 7-7
digital monitor 7-7
bar graph display indicating LEDs 2-2
bar graph display indicator 2-2, 7-7

【C】

cascade mode 5-20
changing normal display mode items .. 7-2
channel display LEDs 2-2
compensating lead wire 4-3
computational expression 5-1, 6-1
computation processing cycle 5-17
computational unit 5-1
computational unit monitor data 5-3
configuration data 5-1, 5-4
connecting input 1 4-9
connecting input 2 4-9
connecting input 3 4-9
connecting the auxiliary outputs 4-11
connecting the communications interface 4-15
RS-232C communications interface 4-15
RS-485 communications interface . 4-15
connecting the control output 4-10
connecting the digital outputs 4-14
connecting the open collector digital
outputs 4-13
connecting the relay digital outputs .. 4-12
console 2-1
console operation keys 2-3
console unit display display indicators . 2-2
control data 5-3
control data settings 7-12
control computation mode 5-13
control mode indicator LEDs 2-2
control computation settings 5-12
control type 5-22
type 0 5-22
type 1 5-22
type 2 5-23
type 3 5-24
countermeasures against electrical
interference 4-18
creation of a dead band 5-13
crimp-style solderless wire connector .. 4-4

【D】

data arrangement 5-3
derivative-based
(measured value derivative) PID .. 5-14
design data 5-3
determining operation functions 5-10
digital filtering (DIG.FILT) 5-9
digital input 1-1
digital output 1-1
DISP 2-3
display panel 1 2-2
display panel 2 2-2
display panel 2 indicator LEDs 2-2
display panel 3 2-2
dustproof cover 3-5

【E】

emergency operating mode 5-20
extended terminal base 2-1
external dimensions 3-1

【F】

feedback resistance 4-10
follow mode 5-20

【G】

ground 4-8

【H】

hard dust-proof cover set 3-1, 9-14

【I】

IM mode transition settings 7-22
input 1 1-4
  DC current/voltage 1-5
  resistence temperature detector (RTD) 1-4
  thermocouple 1-4
input 2 1-5
input 3 1-5
input types 1-4
input/output signal monitor data 5-3
instrument mode display LEDs 2-2
insulating transformer 4-8
interlock manual mode 5-20
isolating inputs and outputs 4-19

【L】

layout of extended terminal 4-7
layout of standard terminal 4-6
line filter 4-8
list of internal signals 6-5
list of computational expressions 6-2
loader configuration mode 5-21
loader jack 2-3
location (mounting) 3-3
LSP settings 7-9

【M】

MAN computation 5-15
maintenance 10-1
manual mode 5-20
manual output computation settings . 5-15
manual output settings 7-11
mode 5-19
monitor data 5-1, 5-4
motor automatic adjustment 7-25
motor control method selection 7-24
mounting bracket 3-1, 3-4

【N】

no-voltage contact 4-14
normal display mode 7-2
normal operating modes 5-20
normal PID (deviation derivative) ... 5-13
normal wiring configuration 8-4

【O】

OUT indicator LEDs 2-2
overshoot suppression control 7-37

【P】

panel cutout dimensions 3-2
PC loader 1-1
position proportional control dead zone 7-26
Precautions on wiring 4-1
pressure compensation 5-8
procedure (mounting) 3-4
processing function 5-1
program configuration (not in file) 5-2

【R】

reverse wiring configuration 8-4
RS-485 3-wire system 4-17
RS-485 5-wire system 4-16

【S】

self-diagnostic functions 5-30
smart tuning method selection 7-37
soft dust-proof cover set 3-1, 9-14
sources of electrical interference 4-18
square-root extraction 5-8
standard terminal base 2-1
startup method 7-1
  cold start 7-1
  hot start 7-1
system operating procedures 7-8

【T】

temperature compensation 5-7
terminal cover set 3-1, 9-14
terminating resistance 4-15
twisted shielded cable for instrument use 4-3

【U】

UF1 and UF2 (keys) 2-3
user functions 2-2
using the UF keys 7-15

【W】

wire lead-out direction 4-5

azbil

Yamatake Corporation
Advanced Automation Company

1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan

URL: http://www.azbil.com

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